MODERN MECHANICS
AND INVENTIONS

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SEE PAGE 63

ROCKETING TO THE MOON BY PROFESSOR GODDARD

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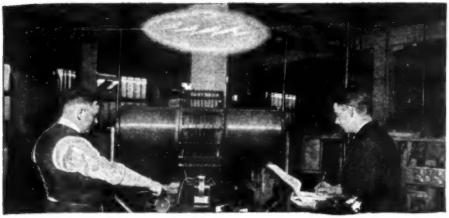

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JANUARY, 1930

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Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

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They Told Him Salesmen Were "Born"

But Now He Makes $10,000 a Year ...Thanks to This Little Book

IT was just a little free book that made the difference between Ed Pinkham and the rest of the men in our shop. Nobody ever imagined that Ed would land, even in the $5,000-a-year class, let alone be making $10,000 before he was thirty. Ed didn't know himself the abilities he had in him as a money-maker.

But one day, a strange occurrence changed his whole life. During his lunch hour Ed started to read a little book he had brought to work with him.

"It's a book called 'The Key To Master Salesmanship,' Bill," he told me. "It's the most amazing thing I ever read. I never dreamed there was so much in salesmanship. You ought to send for a copy yourself. It's free."

"Huh!" said Luke Jones. "Does that book tell you how to become a salesman?"

"It sure does," replied Ed, enthusiastically.

"Don't waste your time," advised Luke. "You can't learn how to be a salesman. A fellow has to be 'born' that way to be a good salesman."

Ed just smiled at that, but he said nothing. Soon afterward he quit the shop, and we forgot about him. And then last night, I met Ed again—driving a snappy new sedan and dressed like a million dollars.

"For Pete's sake," I said. "What are you doing nowadays, Ed?" He smiled. "City salesmanager for the Steel Castings Company," he told me. "What are you doing?"

"Still at the shop," I replied. "But what I want to know is, how do you come to be salesmanager for Steel Castings? They're one of the biggest firms in the business."

Ed smiled again. "Remember that book on Salesmanship that Luke Jones was kidding me about one day? Well, when I finished my Salesmanship training the Association I took it from gave me a choice of twenty-two jobs through their Free Employment Department, and I took a position as salesman for Steel Castings Company. They made me City Sales Manager three months ago at ten thousand dollars a year."

"Good night!" I said. "And Luke and I are still punching the old time clock!"

Ed looked at me seriously. "See here, Bill," he said. "Are you sport enough to risk two cents that you can do as well as I did? Then spend the two cents to write to the National Salesmen's Training Association tonight and get their free book. Then take their course. When you have your diploma, their Free Employment Department will help you get a good sales job—every year they have calls for over 50,000 salesmen. Not only will they help you get the job but they give you an iron-clad money-back guarantee that you must be satisfied with the training received—or they refund your tuition!"

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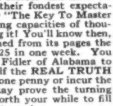

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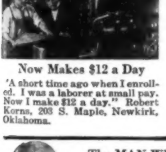

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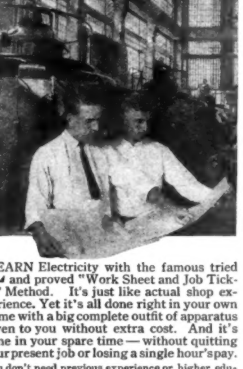

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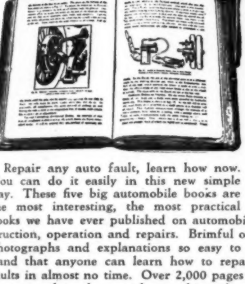

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The Easy Way to Big Pay

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At last—a quick, complete, fascinating way to learn Drafting, and learn it right! Experts acknowledge my new, simple, easy "Picture Method" to be the first new idea in teaching Drafting in 30 years. It's the most easily-grasped, sound and sensible plan ever devised for Home Study instruction—so clear, so interesting, so practical that almost before you know it, you're through—have finished—and are ready to go to work on a Big Pay Job.

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That's what drafting positions lead to. And the draftsman's never out of work the year 'round—for he's the King-Pin of Industry—the man they've got to have. Not a wheel can turn, not a brick can be laid, not a wire can be strung, until the job has first been planned and drawn on paper by a draftsman. Why don't you get into work like that? Why don't you be a man they can't get along without—a Big Pay Man with a year 'round Big Pay Job? You can—it's easy—I'll show you how!

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With my new method, I'll help you get ready for a Big Pay job so quickly you will be astonished. Spare time only needed. With my method—you see how it's done, and you do it yourself almost **automatically.** It's amazingly simple—yet so thorough and complete you learn Drafting from A to Z—learn it so you can sit in with the best of them on the Jobs that pay Big Money.

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Send me your book "Draw Big Pay in Drafting" and tell me more about your "Picture Method." This does not obligate me in any way.

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This is a Machine Age—and all Machinery Starts with DRAFTING

The All-American Team Chooses the All-American Skate

NESTOR JOHNSON

Alfred M. "Freddy" Dion
Clarkson Tech., right defense

"JOHNSONS are the best skates I have ever used. The shoe gives my feet perfect support and always keep my ankles firm and steady. I have such confidence in my JOHNSONS that I never heed give them a th ught during a game."—Alfred M. Dion.

"Molly" Bott
Dartmouth, goalie

"JOHNSONS certainly are top-notchers. They fit so perfectly and have such wonderful balance that they actually feel like part of your feet. I'd be lost without my JOHNSONS."—Molly Bott.

Donnie McFadyen
Marquette, center

"My game has improved greatly since I started to use JOHNSONS. Good contacter, skating is faster, and I feel more at home on the ice. There is something about the runners . . . a lifelike feeling . . . that cannot be found in any other skate."— D. M. McFadyen.

There's no argument. The All-American Hockey Team unanimously selects JOHNSONS as the All-American Skates. A great tribute from great skaters, but JOHNSONS richly deserve it. They have made the game of hockey what it is today—"lightning on ice."

Years ago, Nestor Johnson perfected the first pair of tubular skates ever made in the United States or Canada. Almost overnight these new skates took the country by storm. They were lighter, handier . . . had more life and vitality than the old style flat steel skates. They revolutionized skating . . . made it a finer, faster, safer sport. Hockey and racing took on lightning-like speed. Ordinary ice skating rose to new heights of popularity.

Today JOHNSONS are the finest skates you can buy. They give the proper support to your ankles and arches. And you will be really surprised to find how much easier it is to skate on genuine JOHNSONS. The fine Vanadium Tool Steel Runners . . . "Diamond Tested" to prove hardness . . . have a sharp, razor-like edge that makes skating a new pleasure. **To get this wonderful skating, be sure to ask for and insist upon the original and genuine JOHNSON Skates and look for the full name NESTOR JOHNSON.**

Bobby Giddens
Harvard, right wing

There is a ruling at Harvard which prohibits undergraduates from publicly endorsing a product. However, it is known that Bobby Giddens regards JOHNSONS as the real All-American skates.

W. H. "Ding" Palmer
Yale, left wing

Yale, too, prohibits endorsement of products. But it goes without saying that Ding Palmer knows that no other skates can take the place of JOHNSONS on the hockey rink.

John G. Jones
Princeton, left defense

"My JOHNSONS are my best friends. 'Wings of Steel' certainly describes them accurately. You can easily tell that the runners are made of the finest Vanadium steel by the way they take hold of the ice. And I have found that they stay sharp longer than other skates. JOHNSONS never fail a hockey player."— John G. Jones.

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JOHNSONS are made in Hockey and Racer styles for boys and girls, men and women. Hockeys for general skating; Racers for speed skating.

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Aluminum Finish, with shoes $10.00 per pair
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Aluminum Finish, with shoes $7.50 per pair
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The Collegiate
(with hard toes)
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"Thank you very much for your assistance, which enabled me to secure a position as draftsman with the Mississippi Valley Power Company."
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We believe it will pay you to investigate Drafting. Many of our most successful Contractors and Engineers STARTED in the Drafting room. That opportunity to get to the top—to meet big men—to take charge of important projects is the best feature of Drafting.

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R.T.I. Famous "3 in 1" Home Training Radio—Television—Talking Pictures

Qualifies you easily, quickly and surely for Big-Pay Jobs in RADIO or either of its new and fast-growing sister industries—TELEVISION and the TALKING PICTURES. Your age or previous experience do not matter.

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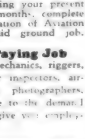

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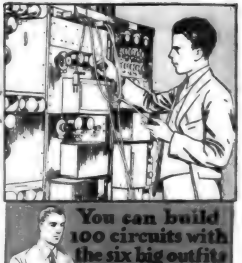
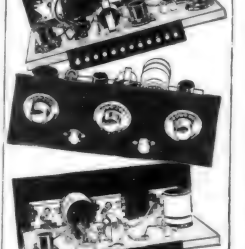


You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



Find out quick about this practical way to big pay

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$375 One Month in Spare Time

"Recently I made $375 in one month in my spare time installing, servicing, selling Radio Sets."

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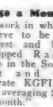

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NTS

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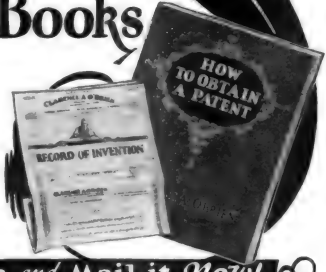

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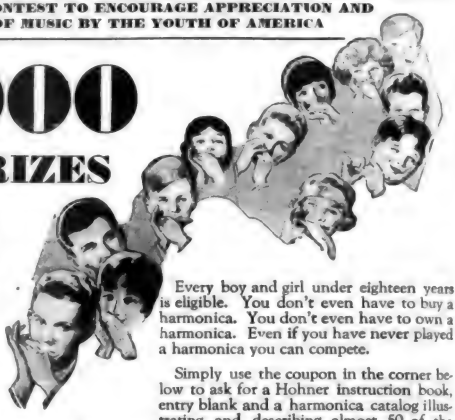

Every boy and girl under eighteen years is eligible. You don't even have to buy a harmonica. You don't even have to own a harmonica. Even if you have never played a harmonica you can compete.

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Contest Editor, Dept. 561-A

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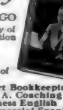

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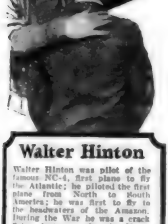

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RUSH COUPON

Try Outfit 10 Days
Act QUICK and get this Complete Body Building Outfit at the mere price of a good hat! Includes 10-Cable Progressive Exerciser, with patented Handles, Headgear, Foot Stirrup, 12 weeks' Home Instruction Course and Health Encyclopedia. This sensational offer gives you the whole works for ONE-FOURTH its real worth—and the Titus Grip Machine costs you NOTHING. Sent complete for 10 DAYS' TRIAL. You don't risk a cent, so mail that Coupon RIGHT NOW.

At the right, cross section of a cable in the McFadden Chest Expander, a solid mass of heavy rubber strands — the best quality live para rubber. At right, cross section of cable from ordinary exerciser, a little bundle of thin rubber bands covered with a lot of useless cotton to make it **look big.**

MICHAEL McFADDEN, Dept. W-146
55 East 11th St., New York City

FREE— The Famous Titus Master Grip

Michael McFadden (Dept. W-146),
55 East 11th St., New York City.
Dear Sir: Enclosed is $7.98 (⅓ regular price). Send me the whole McFadden Outfit ON TRIAL—10-Cable Exerciser, Handles, Head Gear, Stirrup, 12 Weeks' Home Instruction Course, Health Encyclopedia. Also include Titus Master Grip without extra charge. If I am not more than satisfied, I will return outfit in 10 days and you will refund my money in full
(Print Plainly)
Name .....
Address .....
Town ..... State.....

MUSCLES OF STEEL FROM CABLES OF STEEL

High Tension Steel! The strongest, livest Chest Expander that ever built muscles. 5 big steel springs. If you want mighty muscles of steel, this is the outfit that will give them to you—quick!

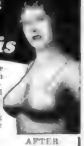
LIVE TENSION—that's the secret! That's why this wonderful steel spring Chest Expander build-**panther muscles**—charged with dynamic speed and power. These 5 steel springs are **alive** with PEP. They not only build BIG Muscles—they develop the fast, agile strength that makes champion athletes. And the patented handles are adjustable to any number of springs, so that you can get **any degree of resistance.**

I want you to TRY this new kind of muscle builder. Use it for 10 days at my risk. Along with it I'll send you **complete** instructions for developing **every muscle in the body.** Just deposit special low price of only $4.98 with postman on delivery. If not delighted after trial, I'll return every penny. Write for this great Steel Spring Chest Expander and Instructions TODAY.

TRY THE WHOLE OUTFIT 10 DAYS AT MY RISK

Michael McFadden, Dept. Wa-146, 55 East 11th St., New York, N. Y.

Let Me Develop YOUR Form Like This



It is **so** easy to have the lovely, full, firm Bust that fashion demands. My wonderful new Miracle Cream quickly fills out the contours, enlarging the breasts from one to three inches.

BEFORE **Beautiful Breasts in 30 Days** AFTER

Are you flat-chested? Do ugly, sagging lines rob you of your feminine charm? Just the simple application of my dainty, luscious cream will work wonders!

FREE Complete private instructions for moulding the breasts to rounded, shapely proportions included with your jar of Miracle Cream.

Special Offer Now! Send only $1.00 for large jar of Miracle Cream. Mailed in plain wrapper. Write today.
NANCY LEE, Dept. M-1, 853 Broadway, N. Y. City

"WE SET OUR GOAL AT $5000 A YEAR"

"SIX YEARS AGO we sat down to figure what we wanted from life—Margaret and I. And to reach the comfortable scale of living we had set our hearts on, we found it would take $5000 a year! That seemed impossible, it was so much more than I was making, but Margaret had faith that I could do it.

"I enrolled with the International Correspondence Schools and started studying at home. At once I gained a new and wider view of my job—did better work. After four months the boss asked what had happened to me, and I told him. That day I got the first of my promotions.

"We passed the $5000 mark this year and we're going right on. Thanks to my I. C. S. training, I can give my family an attractive home, a good car, all the comforts they need. It means school and college for the boys, more leisure for Margaret, and vacation trips for all of us. Do you wonder we're boosters for the I. C. S.?"

Is *your* family budget cramped by your salary? In one hour a day of your spare time, the I. C. S. can help you to climb out of the rut and into a bigger, better-paying job. Set your own goal. We can help you reach it. *Today* take the first step.

MAIL THE COUPON FOR FREE BOOKLET

INTERNATIONAL CORRESPONDENCE SCHOOLS, Box 2321-C, Scranton, Penna.
"The Universal University"

Without cost or obligation on my part, please send me a copy of your 48-page booklet, **"Who Wins and Why,"** and tell me how I can qualify for the position, or in the subject, *before* which I have marked an X:

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Personnel Management
- ☐ Traffic Management
- ☐ Accounting and C.P.A. Coaching
- ☐ Cost Accounting
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Business Correspondence
- ☐ Show Card and Sign Lettering
- ☐ Stenography and Typing
- ☐ English
- ☐ Civil Service
- ☐ Railway Mail Clerk
- ☐ Mail Carrier
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ Illustrating ☐ Cartooning
- ☐ Lumber Dealer

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Foreman
- ☐ Concrete Builder
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Electrical Engineer
- ☐ Electrical Contractor
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Electric Car Running
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Gas Engine Operating
- ☐ Automobile Work
- ☐ Aviation Engines
- ☐ Plumber and Steam Fitter
- ☐ Plumbing Inspector
- ☐ Foreman Plumber
- ☐ Heating and Ventilation
- ☐ Sheet-Metal Worker
- ☐ Steam Engineer
- ☐ Marine Engineer
- ☐ Refrigeration Engineer
- ☐ R. R. Positions
- ☐ Highway Engineer
- ☐ Chemistry
- ☐ Pharmacy
- ☐ Mining Engineer
- ☐ Navigation ☐ Amateur
- ☐ Iron and Steel Worker
- ☐ Textile Overseer or Supt.
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming
- ☐ Mathematics
- ☐ Radio

Name ..... Street Address .....

City ..... State ..... Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

4 of the 40 Easy Ways to Make $3.00 an Hour In Your Spare Time in RADIO

THE four plans shown are but a sample of the many ways in which our members are making $3.00 an hour upwards, spare time and full time, *from the day they join the Association.* If you want to get into Radio, have a business of your own, make $50 to $75 weekly in your spare time, investigate the opportunities offered the inexperienced, ambitious man by the Association.

Our Members Earning Thousands of Dollars Weekly

The Association was formed to help men cash in on Radio. It makes past experience unnecessary. As a member of the Association you are trained in a quick, easy, practical way to install, service, repair, build and rebuild sets—given sure-fire money-making plans developed by us—helped to secure a position by our Employment Department. You earn while you learn, while you prepare yourself for a big-pay Radio position.

The Association will enable you to buy parts at wholesale, start in business without capital, help you get your share of the $600,000,000 spent annually for Radio. As a result of the Association, men all over the country are opening stores, increasing their pay, passing licensed operator examinations, landing big-pay positions with Radio makers.

Mail Coupon for the FREE HANDBOOK

It is not only chock-full of absorbing information about Radio, but it shows you how easily you can increase your income in your spare time. Mailing the coupon can mean $50 to $75 a week more for you.

Radio Training Association of America
4513 Ravenswood Avenue Dept. MM1, Chicago, Illinois

Below are a few reports from those cashing in on the "easy ways"

Clears $3,000.00 Frank J. Deutch, Pa.—"Since joining the Association I have cleared nearly $3,000.00. It is almost impossible for a young fellow to fail, no matter how little education he has, if he will follow your easy ways of making money."

$1,100.00 in 6 Weeks J. R. Allen, Calif.—"Have done over $1,100.00 worth of business in the last 6 weeks. Next month I am going to open up a store of my own. I never knew that money could come so fast and easy."

$25.00 a Week Spare Time N. J. Friedrich, N. Y.—"I have averaged $25.00 a week for the last 7 months even though I am not a graduate but just learning."

Training Lands Him Job R. C. Kirk, N. C.—"Your training has been very valuable to me. I landed a job with the big department store out here a few weeks ago because I had my membership card with me. There were a large bunch of applications ahead of me."

ACT NOW

If You Wish NO-COST Membership

For a limited time we will give to the ambitious man a No-Cost Membership which need not—should not—cost you a cent. For the sake of making more money now, and having a better position in the future, mail coupon below *now.*

Radio Training Association of America
Dept. MM1, 4513 Ravenswood Ave., Chicago

Gentlemen: Please send me by return mail full details of your Special No-Cost Membership Plan, and also a copy of your Radio Handbook.

Name _____

Address _____

City _____ *State* _____

We Want A Name

for this new wonderful SHAMPOO

THIS OFFER OPEN TO EVERYONE

It makes no difference who you are or where you live, we want you to send us a name for this new and unusual shampoo. Whoever sends the most suitable name will win $1000.00—nothing else to do. Just write or print the name on any kind of paper. NEATNESS DOES NOT COUNT.

WIN $1000.00 CASH

Any Name May Win!

No matter how simple you think your suggestion is, you cannot afford to neglect sending it at once. Any name may win. The names of people, flowers, trees, birds, etc., may be submitted for a name or you can send a coined word or a word made by combining two or more words such as "Sun-gleam," "Youthglow," etc., or your name might suggest the handy new container, our latest sanitary tube from which the shampoo is simply squeezed out. No bottle to break, leak or spill, no cake of soap to lie around and collect germs. Nothing safer or more sanitary and convenient for travel. There is nothing more to do, simply the person sending the most suitable suggestion for a name will receive $1000.00 in cash or, if prompt, $1100.00 in all.

Nothing to Buy--Nothing to Sell

Win this $1000.00 cash prize by a few moments' thought. How can you earn this amount of money easier or more quickly? Remember, there is no obligation! The person submitting the winning name will have nothing else to do to win the $1000.00 and the extra $100.00 if prompt, *there is nothing to buy or sell.* Only one name will be accepted from each contestant. We are offering one hundred other big cash prizes ranging from $8000.00 down as a part of our novel advertising plan to make the products of the Paris American Pharmacal Company better known. Everyone sending us a name for our shampoo regardless of whether it wins or not, will be given an opportunity to win the $8000.00 first prize or one of the other one hundred cash prizes. The winner of the $1000.00 cash prize ($1100.00 in all if prompt) offered for a name for our shampoo may by participating in our other prize offers win an additional $8000.00 or a total of $9100.00. You have everything to gain and nothing to lose as it costs you nothing to send a name. Do it today. The very name you think least of may be the winner.

PARIS AMERICAN PHARMACAL CO.

1201 McCune Bldg. DES MOINES, IOWA

$100 EXTRA for Promptness!

To get quick action we are going to pay the winner an extra $100.00 for promptness, or $1100.00 in all so send your suggestion AT ONCE!

Contest Rules

This contest is open to everyone except members of this firm, its employes and relatives. Each contestant may send only one name. Sending two or more names will cause all names submitted by that person to be thrown out. Contest closes April 30, 1930. Duplicate prizes given in case of ties. To win the promptness prize of $100.00 extra, the winning name suggested must be mailed within three days after our announcement is read.

$1000.00 NAME COUPON

PARIS AMERICAN PHARMACAL CO.
1201 McCune Bldg., Des Moines, Iowa.
Enclosed with this coupon on separate sheet is my suggestion for a name.

Date this announcement was read .....

Date my suggestion is mailed .....

Name .....

Address .....

Note: Being prompt qualifies you for the extra $100.00 as outlined in this announcement.

ENJOY THE FINEST AVIATION TRAINING

with
The School of

VON HOFFMANN

America's Leading School of AVIATION

United States Government APPROVED SCHOOL for Transport-Limited Commercial Private Pilot & Ground Course

There is money for you in aviation if you get thorough training now! Our courses will give you this training—they are taught under the direction of U. S. licensed transport pilots and mechanics and cover everything about planes, motors, their maintenance and construction. The training which the student receives at the School of Von Hoffmann is the exact training which he must have to qualify for immediate positions on the ground or in the air. Our equipment is new and of modern design, subject to daily U. S. Government inspection—the cost is low considering actual flying and the thoroughness of ground instruction on latest modern type planes, Wright Whirlwind and other standard motors. No student bond required.

Easy Monthly Payments

It is *easy* to pay the Von Hoffmann way because small monthly payments are extended. Let us show you how you can start now and pay later, even after you have finished the course of training.

Mail this Coupon

World's Famous Pilots Trained Here

Our field is identified in the world of Aviation as an outstanding place to enjoy the best training,—a place where conditions are ideal—from here was started the 'cross the Atlantic Flight that convinced the world what could be done and more recently the world endurance flight record was established here.

VON HOFFMANN AIRCRAFT SCHOOL
225 Lambert-St. Louis Flying Field

VON HOFFMANN AIRCRAFT SCHOOL
225 Lambert St. Louis Flying Field
ST. LOUIS, MO.

Name . . . . . .
Address . . . . . .
City . . . . . State . . . .
Age . . . . . I am interested in

☐ Flying Course ☐ Ground Course
☐ Welding Course ☐ Home Study

Draftsman's Pocket Rule

GIVEN TO YOU

See Money-Making Tools Below

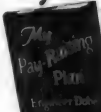
FREE

If you are 16 or older and will copy Jack shown at right and mail it to me I will send you a Draftsman's pocket rule, free.

Copy my name and get Jack's Rule Free—Today

Just Copy This Jack Today!

NEW Pay-Raising Plan



Write to me. I will send you this new book. Not a catalog. My Pay-Raising Plan and Money Making Advice. I can prove that John Savadge, trained by me, makes $300 a month. Earl J. Dupree, trained by me, refused $600 a month because he makes more in his own business. A. H. Bernier, trained by me, earns $7000 to $9000 a year. Arthur Dewalt, trained by me, makes more than $600 a month. D. C. Stroop, trained by me, makes $475 a month. L. V. Broughten, trained by me, makes $300 a month.

Now is the time to learn to be a draftsman. Get Free, "My Pay-Raising Plan." Send for it at once. Let me tell you how some Dobe Draftsmen make $250.00 to $750 a month. Read this advertisement clear through. See for yourself how you can make real money as a draftsman. Read how much work there is for them.

Age or Lack of Education No Drawback

You do not need previous experience. You do not need to be a high school graduate. My practical, home study course gives you just the kind of training you need to become successful, during only your spare time.

I Train You at Home

My practical working method makes every step in learning drafting as clear as a moving picture. That's why I train you so fast to be a draftsman.

Money Back If Not Satisfied

I train you under a positive Money Back Agreement. If my training does not satisfy you after you have finished you get every penny back.

Earn While You Learn

You can start earning extra money a few weeks after beginning my training. I give you special work and tell you how to make money.

Money-Making Tools Furnished by Me

You get these fine quality, genuine, imported draftsman's tools, just as soon as you become my student. No finer tools made for practical drafting work.

Employment Service

After training you I help you to get a job without charging you a cent for this service. Employers of draftsmen come to me for men because they know that men I train make good.

Draftsmen Needed In:

Auto Work
The automobile industry is one of the greatest in America. Thousands of draftsmen needed. I'll train you for the work.

Electricity
Electricity is the most modern force of the world. Draftsmen are needed in every department of this fascinating work. I'll train you at home. Get a job here.

Aviation
Aviation is just in its infancy. Draftsmen are required in numerous positions. Draftsmen are essential to it. Fit your self quick at home for drafting position.

Motor Bus Work
Motor bus building and motor bus transportation have become leading industries. Draftsmen are in charge of engineering staged in this work. I'll show you the way.

Building Work
There will always be building. No structure can be erected without plans drawn by draftsmen. Learn to do it at home. Become a draftsman.

"If You Earn Less Than $70 a Week Write Me Today! I Will Train You At Home"

Engineer Dobe

ACT NOW Before You Put this Magazine Down Let me send you my books "Successful Draftsmanship" and "My Pay Raising Plan". Remember Draftsmen are needed everywhere. That's the kind of profession to get into. Get started now. Get into a better position, paying a good straight salary the year around.

Engineer Dobe 1951 Lawrence Avenue Div. 23-51 Chicago, Ill.

Mail Sketch—Get Free Rule

ENGINEER DOBE
1951 Lawrence Ave., Div. 23-51 Chicago

Here's the sketch. Send me free rule; also send me free of all cost books "Successful Draftsmanship" and "My Pay-Raising Plan."—how to earn money while learning and proof of big money paying positions.

Name..... Age.....

Address.....

Post Office..... State.....

BRAND NEW

GENUINE CORONA *Model 3*

Lowest Price—Easiest Terms Ever Offered

HERE'S your chance to own that *brand new* Genuine Model 3 Corona you've wanted — on the easiest terms ever offered — at LOWEST PRICE ever offered. Complete in every detail; back spacer, etc., *Manufacturer's Guarantee.* Recognized the world over as the finest, strongest, sturdiest portable built.

Yours for 10 DAYS FREE

Only a limited number of these splendid machines available. To get one, you must act now! Experience the joy this personal writing portable typewriter can give you! Use it ten days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office desk, home, traveling. Small, compact, light, convenient. Don't send out letters, manuscripts, reports, bills in poor handwriting when you can have this Corona at such a low price on such easy terms. Remember these are *brand new* machines right out of the Corona factory.

Carrying Case FREE
If You Act Now!

Leatheroid carrying case, oiler, instructions free on this offer. Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only $2—then $3 a month until our special price of $39.90 is paid. Now is the time to buy. Special Xmas Package if you act now.

Save Money—Use this Coupon

Smith Typewriter Sales Corp., (Corona Division)
469 E. Ohio St., Chicago, Ill. Dept. 171

Ship me the Corona, F.O.B. Chicago. On arrival I'll deposit $2 with express agent. If I keep the machine, I'll send you $3 a month until the $37.90 balance of $39.90 price is paid; the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent, who will refund my $2. You are to give your standard guarantee.

Name _____

Address _____

Recommended by _____

TRAVEL ON "UNCLE SAM'S" PAY ROLL

RAILWAY POSTAL CLERKS
$158 Month First Year
Raise to $225 Month

Many other U. S. Government Jobs Open to Men and Boys 18 Up

Post Office Clerks — **City Mail Carriers** — **Rural Mail Carriers**

Clerks—Customs and Internal Revenue Service

Prohibition Agents—Clerks at Washington, D. C.

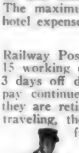
These are steady positions. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "Hard Times" in the U. S. Government Service.

ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home. Early examinations are expected.

PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. They are furnished with a railroad pass for official business.



City Mail Carriers—Post Office Clerks

Clerks and Carriers get $1700 the first year regular and automatically increase $100 a year to $2100 with further increase to $2300. They also have 15 days vacation. February examinations will be held in many cities. City residence is unnecessary.

What Will You Earn 5 Years from Now?

DO YOU EARN $1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2700 OR MORE A YEAR, EVERY YEAR?

→ Get Free List of Positions

Fill out the coupon. Tear it off and mail it today—now, at once. DO IT NOW—This investment of two cents for a postage stamp may result in you getting a life U. S. Government Job.

MAIL COUPON TODAY

FRANKLIN INSTITUTE
Dept. C-111
ROCHESTER N. Y.

Rush to me entirely free of charge 32 page book with (1) a full description of the position checked below; (2) a list of U. S. Government Jobs now obtainable; (3) Tell me how to get the position checked.

- ☐ **Ry. Postal Clerk, ($1900-$2700)**
- ☐ **Post Office Clerk...($1700-$2300)**
- ☐ **City Mail Carrier...($1700-$2100)**
- ☐ **Rural Mail Carrier...($2100-$3300)**
- ☐ **Clerk in Gov't Offices...($1260-$2100)**
- ☐ **Inspector of Customs.....($2100 up)**
- ☐ **Prohibition Agent.....($2300-$2800)**

Name .....

Address .....

Use This Coupon Before You Mislay It—Write or Print Plainly

Thank You for Mentioning Modern Mechanics and Inventions for January When Writing to Advertisers

Broadcasting Station WISN is operated from The School of Engineering; also Amateur Station W9BO.

WISN

"NOW I will train YOU for BIG PAY in ELECTRICITY

IN YOUR OWN HOME

Just as I have trained 25,000 Graduates in my Great Electrical School"

Established 1903. Chartered by State of Wisconsin.

Oscar Werwath, E. E.

Director of the Extension Division, School of Engineering — Pioneer in electrical training for 25 years.

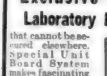
Home Shop-Laboratory Without Extra Cost!

A Full-sized Home Shop-Laboratory (not toys) that you can't duplicate for $50, included with each course without extra charge.

Exclusive Patented Laboratory Equipment

that cannot be secured elsewhere. Special Unit Board System makes fascinating sportof laboratory experiments. Amazingly easy to use.

Learn By Doing



No mere book on theoretical study —but PRACTICAL training on full-sized motor, switchboard, circuits, and electrical equipment.

Satisfaction Guaranteed

You can take S. of E. Home Shop-Laboratory training without risking a penny. Guarantee Bond protects you.

NOW, through my Extension Division, I will train you for advancement and MORE PAY in Electricity without your leaving your home! You will get the same course, the same methods, the same faculty of skilled engineers that have made The School of Engineering internationally famous.

Behind your training will be an institution specializing in Electricity. Not a mere correspondence school but a fully established college, over 25 years old, recognized by the U. S. Gov't. Thousands of S. of E. graduates now employed in important positions with largest concerns in the country.

Diesel Engines for the Panama Canal, on which S. of E. Students assisted with acceptance tests at the request of U. S. Government.

ELECTRICALLY TRAINED MEN Earn $3,000 to $10,000 a Year

In Radio, Television, Aviation, Automotives, Refrigeration, Moving Pictures, Super-Power, Lighting—Electricity is the key. Big manufacturers are pleading for men trained in **Practical Electricity.** Salaries of **$3,000 to $10,000** a year now are common. Here is a vast field for you, with unlimited opportunities. **Now** is the time. Start on the road of Electrical Training that leads to bigger pay—bigger opportunities—and SUCCESS!

EARN AS YOU LEARN

Cash in on your Electrical Training while you're learning. Many students report increased earnings, advancement, even while studying. Train in your spare time at home. Employment Service renders FREE aid for life. Lifetime Consultation Service. Many exclusive features available nowhere else. Mail the coupon today for full particulars.

EXTENSION DIVISION

SCHOOL of ENGINEERING

Dept. 43, Milwaukee, Wisconsin

FREE!

Send Coupon TODAY for FREE illustrated Catalog — "Practical Electricity—the Key to Success"—and full details of Extension Division Training.

MAIL COUPON NOW!

Extension Division, Dept. 43
SCHOOL OF ENGINEERING
Milwaukee, Wisconsin

Please send me without obligation, FREE illustrated catalog, "Practical Electricity—the Key to Success," and details of Extension Division training.

Name.....

Address.....

.....

Follow Him!

IMAGINE the keen thrill that would be yours following some case like this: The escaping desperado is a notorious international character with a long record. He's wanted in five countries. Rewards range from $5000 to $25000 for his capture. He loots a palatial mansion. Kills two men. Escapes. Disappears. Changes his entire appearance. Pulls a clever "dead" fake and is recorded as "Dead" on all police records. Dead to all records except ONE—the Inevitable Finger Print.

For ten years he deceives the world. Prospers. Becomes a social lion. And then—Bang!—the Finger Print Expert nabs him. Society is shocked. They can't believe that this social Prince is the famous Mr. "X" of criminal fame 10 years ago. But finger prints do not lie. Never! The Finger Print Expert always wins. Glory, fame, rewards are always his.

Thrills! Rewards! Await *YOU!*

Imagine the thrill, mystery, glory, fame and reward that would be yours if you were this Finger Print Expert. You can make them yours if you will. You can learn the secrets of this great science at home in your spare time. Any man of ordinary ability who can read and write can become a Finger Print Expert in a short time at a small cost.

A brilliant career and a handsome income with world-wide opportunities awaits you. Act Now. Don't let the other fellow enjoy what is rightfully yours. Mail that coupon now and learn the great things that are in store for you.

PARTIAL LIST
Graduates [of] A. S. Secretly employed Finger Print Experts of these States, Cities and Institutions.

State of Iowa
State of Idaho
State of Colorado
State of Washington
State of Michigan
Detroit, Mich.
Detroit, Mich.
Pittsburgh, Pa.
Pittsburgh, Pa.
Lincoln, Nebr.
Birmingham, Ala.
Columbus, Ohio
Havana, Cuba
Calgary, Alta., Canada
Dallas, Texas
Houston, Texas
New Haven, Conn.
Great Falls, Mont.
Galveston, Texas
Albany County Penitentiary, N. Y.
Albany, N. Y. [Navy
Wilkes Barre, Pa.
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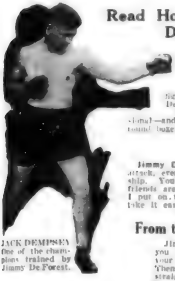

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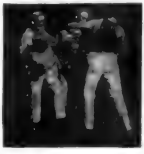

The famous Dempsey Roll, showing exactly how the champion feinted and hit

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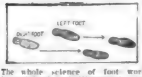

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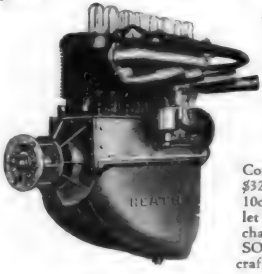

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They dared Officer Kane to play

.. and his music held them spellbound

ETHEL'S house party was at its height—when suddenly there came an ominous knocking at the door. Ethel ran to open it and—there stood Police Officer Kane.

"I want to see the man of the house," thundered Kane.

"I'm sorry," stammered Ethel nervously, "but my father is not at home."

"Well, what's goin' on in here anyway?" continued the officer sternly. "Every one on the block is complainin' of the noise. I've a good mind to arrest the lot of you."

Ethel was mortified—what a disgrace!

"Oh please," pleaded Ethel, "please don't do anything like that."

Then Kane burst out laughing.

"Don't worry, lassie—you were all lovin' such a fine time I couldn't help droppin' in," he explained.

"Oh," sighed Ethel, "how you frightened me. Won't you join us?"

Kane Joins the Party

"Ha," laughed Kane, as the Victrola started again, "why must you play that canned music—can't any of you play this beautiful piano? Sure, I'd like to give you a tune myself."

"I dare you to play for us," shouted Ted Strong.

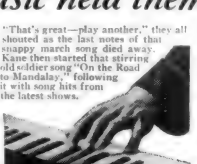
"I'm afraid I'll have to be a-doin'," stammered Kane, embarrassed.

"Mr. Kane, I think you might play for me after the fright you gave me," mused Ethel.

"Well, b'gorry, maybe I will," agreed the officer. And as he sat down at the piano everyone laughed. But the noise stopped when he struck the first rollicking notes of the famous "Song of the Vagabonds."

"More — more..."

"That's great—play another," they all shouted as the last notes of that snappy march song died away. Kane then started that stirring old soldier song "On the Road to Mandalay," following it with song hits from the latest shows.



"Well," he laughed, as they finally let him get up from the piano, "I'll have to be on my way now."

"Thank you for your lovely music," said Ethel. "You must be playing a good many years?"

"Sure, and I haven't been playin' long at all. Then the questions came thick and fast. "How did you ever learn so quickly?" "When do you find time to practice?" "Who was your teacher?"

Kane Tells His Story

"Well, to tell you the truth I had no teacher. I've always loved music, but I couldn't take regular lessons on account of my duties as policeman. Then one evening, I saw a U. S. School of Music advertisement, tellin' of a new way of learnin' to play. I didn't believe it myself but I sent for their Free Demonstration Lesson that showed me how easy it was, so I wrote for the whole course.

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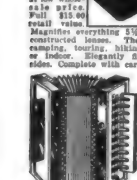

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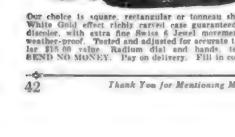

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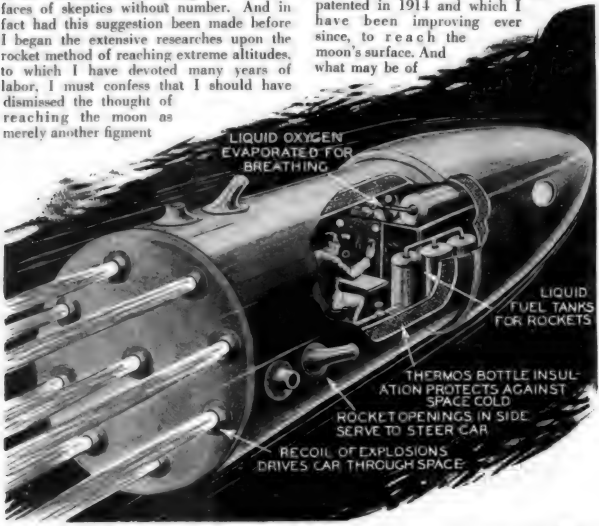
ROCKETING to the

Prof. R. H. Goddard

FOR YEARS scientists have been forced to study the moon through its reflection in the observatory mirror. Since the moon refused to come closer to the earth than 220,000 miles, however, man may find it possible to exercise the alternative of Mahomet and go to the moon, in the opinion of a distinguished man of science. He is Dr. Robert Hutchings Goddard, for six years professor of physics at Princeton University, director of research for the U. S. signal corps at Worcester Polytechnic Institute and Mt. Wilson (California) Observatory during the world war, fellow of the American Geographical Society, member of the American Physical Society, American Meteorological Society and the American Institute of Social Sciences, and for the past ten years professor of physics and director of the physical laboratories of Clark University, at Worcester, Mass.

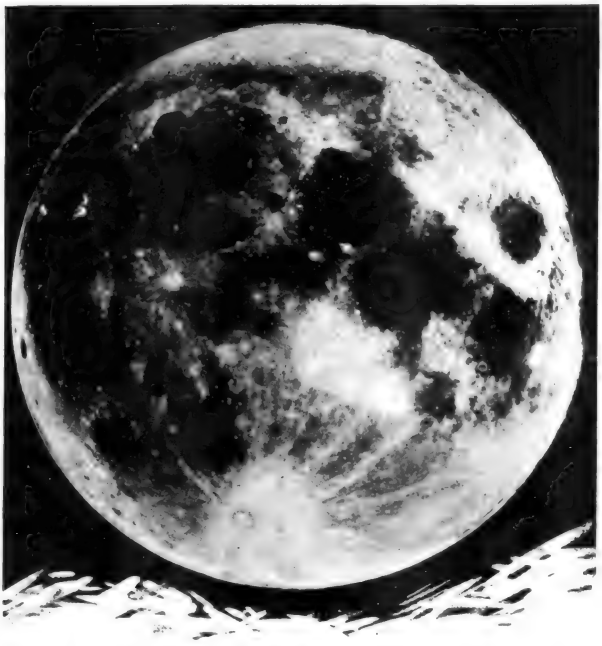
IS IT possible to transport a human being to the moon? To answer that question in the affirmative is to bring smiles to the faces of skeptics without number. And in fact had this suggestion been made before I began the extensive researches upon the rocket method of reaching extreme altitudes, to which I have devoted many years of labor, I must confess that I should have dismissed the thought of reaching the moon as merely another figment of the mind of Jules Verne. Now, however, I am of the firm opinion that it is possible with the use of a rocket of the type I first patented in 1914 and which I have been improving ever since, to reach the moon's surface. And what may be of



An artist's conception of a rocket equipped for a trip to the moon after the manner described by Prof. Goddard in his article. Note the provisions for breathing and insulation against extreme cold.

Moon

by **Prof. R. H. GODDARD, B.Sc., A.M., Ph.D.**
as told to William Robertson



This photo of the full moon, taken from the Mt. Wilson observatory, shows the numerous craters and mountains which pit the surface of the satellite. A rocket landing on the moon would, Prof. Goddard believes, find sufficient chemical elements to recharge its fuel tanks, and therefore would not have to carry a sufficient supply of fuel for the return trip.

particular interest to anyone who might contemplate making a journey thither in this new form of conveyance; I believe it would be possible for him to return to the earth in safety and report to the world the results of the first journey to one of our celestial neighbors.

Contrary to popular impression, I am not at present engaged in an attempt to perfect a rocket which will carry a human being to the moon. That will come later, but it should be understood that what I am now developing is a comparatively small affair and is not intended for reaching heights

Rockets Hold Only Hope of Man's Ever Reaching Moon, Say Scientists

A view of the moon in its first quarter. The latest theory of scientists is that the surface of the moon, with its mysterious dark "lakes," is made up of volcanic dust which is never blown about because of the absence of an atmosphere.

Prof. Goddard holding one of his experimental rockets which attained a speed of 8,000 feet per second, one fourth the speed necessary for it to leave the earth forever.

much greater than just outside the atmospheric envelope of the earth. There are two reasons for this:

First, the expense and time for the development are much reduced if the work is carried out on a small scale.

Second, the uses of such a rocket, even in exploring the atmosphere, are so important that the development seems to stand a good chance of being continued. And furthermore, if anything is designed for the purpose of passing through the earth's atmosphere, it is well to have a knowledge of the earth's atmosphere first.

Although I have been engaged in rocket work since 1914 when I was granted my first patents, the public evinced no particular curiosity regarding the possibilities my investigations might open up and the recent interest displayed came in the nature of a surprise.

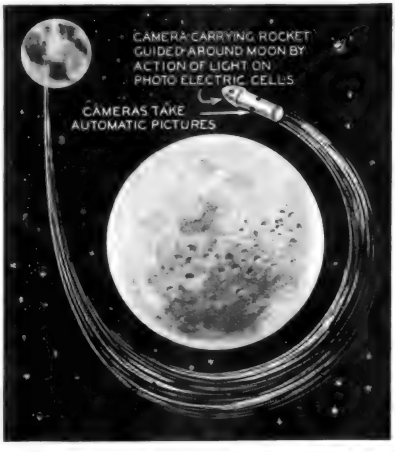
At this moment I am engaged in the highly important problem of stabilization, and feel that it would be premature to give out data upon the results before this matter has been settled, and the work may be called complete. Nevertheless, the tests I have made, including that of July 17th when my experimental rocket was fired several thousand feet, have demonstrated clearly that the method of propelling it is operative and practical.

This new method involves the use of liquid propellants and makes possible a rocket with most of its weight consisting of

propellant material of high energy value. This is the new feature. And it is one that is quite vital if a rocket is to be used for reaching extreme heights. Although all of the basic principles involved in the high altitude rockets were patented by me in 1914, a few of the ideas I advanced at that time have been used abroad but only with black powder rockets.

The liquid propellant I am using is as far ahead of black powder as the automobile is ahead of the horse and buggy. Yet with the use of three black powder rockets, Fritz von Opel, a German, recently succeeded in launching an airplane 75 feet in the air and circling half of a German airport at a high speed before he lost control of the machine.

But the rockets I have been testing for the past nine years, are, so far as I know, the only ones actually constructed that have embodied any considerable number of my original principles.



Before launching a man-carrying rocket to the moon, Prof. Goddard proposes to send a camera-carrying rocket around the satellite, directing its course by means of light-sensitive photo-electric cells.

The first use of the rocket will be to send up instruments which will permit the study of the atmosphere at great heights. Another practical step beyond that, in all probability, will be to send a camera round, and close to, the moon, having it guided throughout the journey by photo electric cells. With the knowledge thus obtained, a trip to the moon may well be planned.

The idea of such a history-making trip appeals most vividly to the imagination and is one to which I have given considerable study.

To the layman, undoubtedly the first thought is:

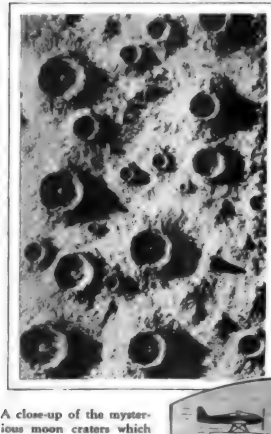
"Who is going to make that first solo flight into the unknown?"

Much risk is to be involved, undoubtedly, but not nearly so much as would seem at first blush were I free to make public the result of my investigations to date. When the time comes to attempt a flight into space the dangers ahead will be proportionately less grave in the light of scientific knowledge than those which seemed apparent when Columbus started west with his caravels over the uncharted seas only to find that the troubles predicted for him were largely imaginary.

And many with the hardihood and the scientific knowledge necessary for this, the most thrilling of all adventures in human experience, will be willing and eager to shove off into the vast unknown.

The great rocket, with a compartment large enough to hold a passenger comfortably with all of the equipment necessary for his task, will not need to carry propellants for the return trip. The chemical elements necessary for refueling exist on the moon to the most careful astronomical observations, and it will be possible for the passenger to take off without any outside assistance for the return journey.

That of itself removes one of the greatest

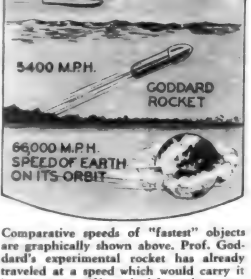


A close-up of the mysterious moon craters which may yield their secrets to the intrepid adventurer who first lands on the moon's surface via rocket. The craters shown average 50 miles across. Shadows are cast by the sun's rays.

difficulties by restricting the weight of the space cruiser. Successive explosions are necessary to propel the rocket and the speed will be governed according to their frequency. This may be regulated automatically or by the passenger himself, from a control board within his cabin.

"Is it possible to acquire the amazing speed necessary for the purpose in mind?" has been asked.

To answer that I will point to the experiment I made last summer with the rocket I am shown holding in my hand in the accompanying photograph.



Comparative speeds of "fastest" objects are graphically shown above. Prof. Goddard's experimental rocket has already traveled at a speed which would carry it into outer space if launched from the moon.

The gases shot from that small rocket at a speed of 8,000 feet (more than 1½ miles) per second.

That is more than 90 miles per minute—enough to send the gases away from the moon forever if fired straight up from her surface. The earth, however, has four times the gravitation force of the moon, and the velocity of the rocket launched into space from our world will have to be four times that great, or 360 miles a minute. That speed may be easily attained by a larger rocket. And thus it can be readily seen that the time required to leave the earth and penetrate into space will be brief indeed.

But how will it be possible for one to live inside this projectile?

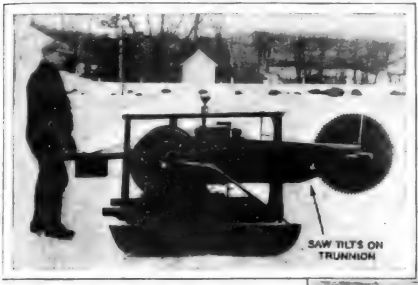
First, I have demonstrated that the rocket can be started without a jar sufficient to endanger life within it. Neither need there be any when the rocket lands. For it will be so equipped that it may be guided to earth as easily and safely as an airplane.

Of course, the passenger must breathe. The simplest plan of supplying oxygen is by evaporating a supply of liquid oxygen carried along. The cold of space would make the transportation of liquid oxygen a comparatively easy matter. Insulation from the cold of space would be by the ordinary "thermos bottle" principle which we know works well down to a temperature nearly that of outer space.

The danger developing from friction would be nil, as no noticeable heat would be generated because the speed through the dense part of the atmosphere would not exceed 2,000 feet per second and the great increase in speed necessary to leave the earth would occur from 20 to 700 miles above terra firma.

According to my calculations, the trip to the moon can be made in 48 hours or an average speed of 4,750 m.p.h., an astonishing rate when compared with the swiftest methods of present-day transportation.

Wood Sawing Outfit Transferred to Sled



George Hill and his home-made ice cutter powered by the gasoline engine off his wood saw. The saw shaft tilts on a trunnion to grip the ice.

BECOMING tired of sawing ice by hand for himself and his neighbors, George Hill, of Norway, Maine, rigged up a home-made sawing outfit by taking the gasoline engine off his wood sawing machine and attaching it to a sledge with ice sawing equipment, as shown in photo at left.

An artist's sketch of Hill's home-built ice cutter capable of cutting hundreds of blocks daily.

Speed Indicator to Aid Typist

A WORD tabulator has been devised for attachment to typewriters to assist operators in watching the speed with which they are typing. Ella Freer, school novice typing champion of New York state, is shown below using a wood tabulator attached to her machine as she practiced for the international typewriting contest at Toronto.

Typist checked by speed record and stop watch.

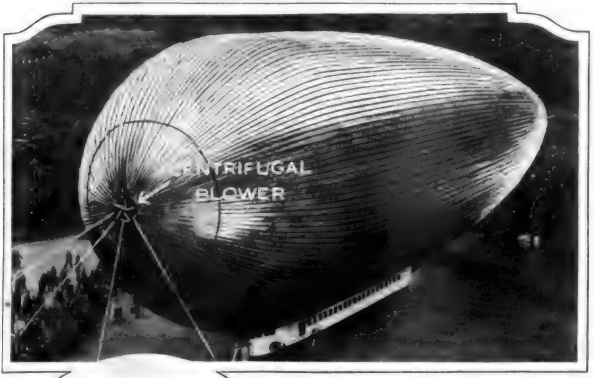
Long-Lived Tools Are Designed

TOOL builders apparently appreciate the tremendous wear and tear on high speed machinery and are making every effort to produce long-lived tools through the use of much heavier parts and a freer use of ball bearings, it was indicated at the National Tool Builders association show in Cleveland. Speed was the keynote and everywhere were machines designed and built for the purpose of speeding up production and lowering costs. Lathes constituted probably the largest group of all machines displayed. It was particularly noticeable that most of the lathes were tooled with tungsten carbide cutting tools using heavier and faster cuts than has been customary. A pronounced trend toward heavier machines was shown in the abrasive equipment with the idea of speeding up production by means of special automatic and semi-automatic grinders for performing various jobs which heretofore have been handled on ordinary equipment.

EARTH is Huge GENERATOR

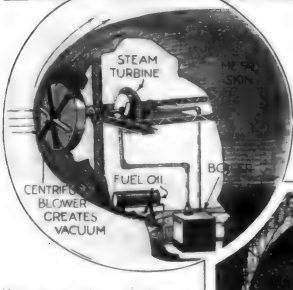
The earth is a great electric dynamo generating more than enough current to supply the ten largest cities in this country for one million years according to a theoretical treatise prepared by Dr. Ross Gunn, scientist and inventor of the naval research laboratories, whose views are illustrated above.

"Vacuum Cleaner Drive" for This All Metal Dirigible

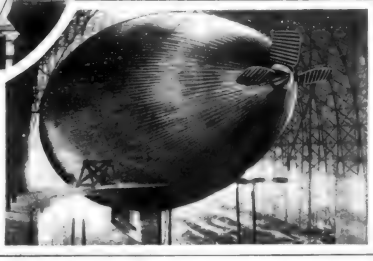


The all-metal steam-driven dirigible "City of Glendale" successfully passes its buoyancy tests.

THE steam-driven all-metal dirigible "City of Glendale" designed and built by Captain T. B. Slade has successfully passed its buoyancy tests but its motive power at this writing has not been proven. The dirigible is to be driven by means of a blower propeller which creates vacuum.



Above is a schematic drawing showing the general features of the "vacuum cleaner drive" used on the Slade all metal dirigible, recently launched at Glendale, California. A turbine-driven centrifugal blower in the nose of the ship is expected to operate in the following manner: air is expelled at the periphery of a blower, as in a vacuum cleaner causing lowered air pressure immediately in front. Normal air pressure to the rear of the ship is expected to push the craft forward at a 100 m.p.h. clip. An elevator to the ground is another novelty.

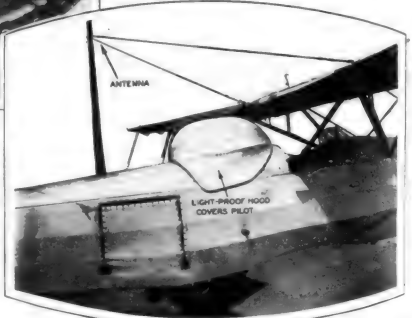


The "City of Glendale" is pictured above in its hangar resting on a slight cross structure, all that is needed to hold it securely. Passengers and freight can be lowered in an elevator from the gondola.

RADIO *Signals Guide*

Jimmy Doolittle, daredevil airplane pilot of the army, recently completed the first totally blind flight in history when he took off, flew, and landed in a plane in which the pilot's cockpit was covered with a lightproof hood. Radio waves kept him on his course. The full story of this great flight which has conquered fog as an aviation peril is given

By MAJOR H. H. ARNOLD



Lieut. James Doolittle, "the Army's best flyer," is shown above in the cockpit of one of his planes. Long famous for daring aerial stunts, Doolittle's latest feat of flying a plane blind, guided only by radio impulses, ranks as one of his greatest. At the right is shown the plane which he used, with the cockpit entirely covered with a light-proof fabric.

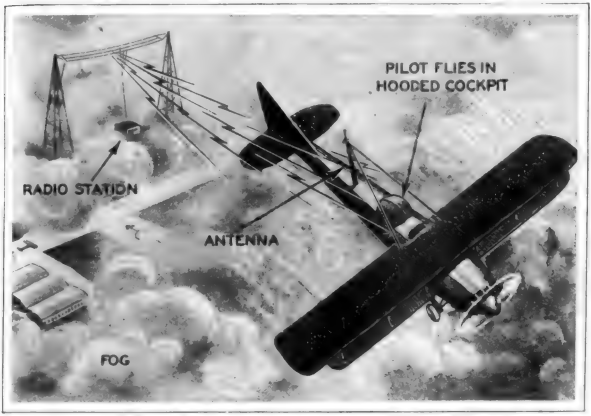
ON A pleasant afternoon a few days ago a two-place Consolidated biplane was hauled out on Mitchel Field, Long Island, all tuned up for a flight. It was by no means an ordinary airplane—in fact, it was a plane destined to write aviation history. A post projecting up from the fuselage supported a wireless antenna which ran to the wings. A covering of thick fabric which completely excluded the light of day was drawn over the rear cockpit of the plane.

Into that cockpit crawled Jimmy Doolittle, better known as king of aerial daredevils, also described as the Army's best flyer. The covering was adjusted over his head so that all he could see was his lighted instrument board and the interior of the cockpit. With only instruments to guide him, Doolittle took off in the ship, flew for fifteen miles, and returned to his starting point, setting down the plane in as perfect a landing as if he could see the ground below him. Thus ended the first totally blind flight in airplane history.

Three new instruments made Doolittle's epochal flight possible. These were a radio direction finder, an artificial horizon, and a super-sensitive altimeter registering accurately within 20 feet.

The radio direction finder consists of two reeds vibrating in consonance with a short range radio beacon. When the plane is directly in the path of the beacon, the two reeds vibrate uniformly, but when the ship

Plane in Blind Flight



Drawing gives a good idea of the method employed to guide a plane flying blind. Radio impulses from the station are registered on a sensitive instrument in the plane which tells whether the ship is veering from a predetermined course. A super-sensitive altimeter registers height above the ground.

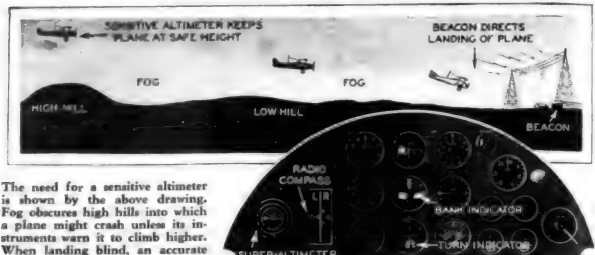
is to the right or left of its course, one of the reeds vibrates more rapidly than the other. The closer the plane is to the beacon, the more rapid the vibration. The artificial horizon shows instantly the flying angle of the plane in relation to the ground, the degree to which the wings are tilted, if at all, and whether the nose is up, down, or level.

The supersensitive altimeter depends on barometric pressure for its operation. Inasmuch as air pressure conditions vary at all times, it is necessary for the pilot to know the barometric pressure at the field he wishes to land on before he can read his altimeter properly. This information was supplied to Lieut. Doolittle by radio. Having calibrated the altimeter, by means of a turning knob, the pilot knows that it will accurately record his height above the ground as he comes down, with no lag in the readings.

Guiding a plane by radio is not in itself a new stunt. The same principle has been employed before, but sound was used rather than a visual instrument. The pilot had to wear earphones which buzzed more loudly in one ear than another as he veered from his course. The reed indicator used by Lieut. Doolittle is much more accurate than the old method.

Aviators herald Doolittle's flight as a sign that fog, the dreaded foe of flying, is at last to be robbed of its terrors. Within a few years all airplanes, it is predicted, will be equipped with simple instruments which will enable a pilot to fly entirely across the continent in fog, knowing at all times just where he is, and able to come down safely at will even though the ground cannot be seen. Altimeters built on the principle of sound reflection, measuring distance by the time required for a sound or radio wave to reach the earth and return, are now being developed which will make it unnecessary

Direction Finder, Super-Sensitive Altimeter Make Blind Flying Possible



The need for a sensitive altimeter is shown by the above drawing. Fog obscures high hills into which a plane might crash unless its instruments warn it to climb higher. When landing blind, an accurate knowledge of height is essential.

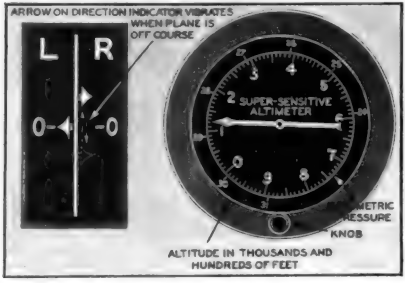
This photograph shows the instruments used by Doolittle in his blind flight. The super-altimeter and the radio direction finder, at left, were the devices on which he mostly depended.

to know barometric pressures.

Blind flying well deserves its description as the terror of aviation. At the speed of a plane's flight, usually around 100 m.p.h., the pilot loses his sense of balance. When the ground is visible he can orient himself by means of objects beneath him, but when fog or darkness intervene he cannot tell, except by instruments, whether he is flying with tilted wings, up or down, or level. In such circumstances he must rely absolutely on his instruments.

Lieut. James Harold Doolittle, as he is formally known, comes honestly by the title of king of the danger darers. He is an experienced pilot of racing planes, and was first to astonish the world by performing that "undoable" feat, the outside loop. At the recent Cleveland air show he literally flew the wings off a plane. Diving at 200 m.p.h., the wings suddenly snapped off. Doolittle came down gracefully in his parachute, jumping into another plane, and went up again to stunt some more before the crowds. This was described as the "big thrill" of the show.

Laconic, as are most flyers, Doolittle's report of the accident which he turned in to his superiors is a classic of its kind. His "description of method of leaving plane" was: "Thrown out." His "complete and accurate account of the causes for the jump" was: "Wing broke." Four words told the story for him. He was in a hurry to get back into his plane so he could fly some more.



A "close-up" of the direction finder and altimeter. When the right reed vibrates, as shown, the plane is to the right of its true course.

An interesting sidelight on Doolittle's blind flight is afforded by the "argument" he had with officials before taking off. Authorities, confident of the reliability of the instruments but unwilling to subject the pilot to unnecessary hazards, insisted that a second pilot occupy the front cockpit to take the controls in case of emergency. Doolittle finally assented but did not once need assistance.

Graphic Science Section

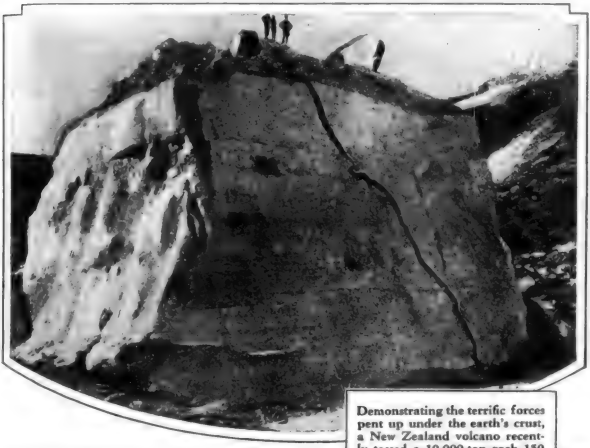
Jimmy Terry, billed as the world's greatest rope walker, recently walked between two Chicago buildings 39 stories above the ground. The stunt required skill and nerve, but the rope walker's balancing pole was arranged as shown in the oval inset so that his task was greatly simplified. The pendulum effect of the weight at the pole's end actually brought gravity to the aid of the performer, holding the pole upright so that he could balance himself by it.

Wrecked Home Demonstrates Power of Speeding Car

This Chicago house, wrecked when a skidding motor bus struck it, gives a graphic demonstration of the natural forces of inertia present in any moving object. An automobile weighing only 3000 pounds, traveling at 40 m.p.h., exerts a striking force of 2700 tons. This house was struck by a five-ton coach!

Scientists tell us that most fruits and vegetables are three-fourths water—even more in the case of the watermelon. Giant vegetables which grow five or ten times the size of their ordinary brothers are usually the result of perfect growing weather in which there has been plenty of rainfall. The squash shown above, exhibited at the Fresno, Cal., fair, weighs 153 pounds. A thunderstorm in the corn belt often means an extra million dollars for the farmers by insuring better crops.

Volcano Tosses 10,000-Ton Rock As If It Were a Pebble



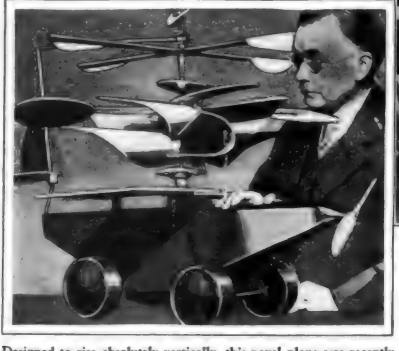
Demonstrating the terrific forces pent up under the earth's crust, a New Zealand volcano recently tossed a 10,000-ton rock 150 feet. The huge rock is shown above, with three figures standing on its top to give an idea of its size. The rock landed directly on top of a homestead, entirely obliterating it. 500,000 horsepower, it is estimated, was expended in moving the rock this distance.

Another demonstration of natural forces is presented in the above photograph of the recent hurricane which howled over the country east of Pensacola, Florida. The palm trees are bending before a 102-mile-an-hour gale, while a lone automobile is stranded hub deep in water blown up from the distant sea shore. Meteorologists explain that storms are simply the result of nature's re-establishing a balance between different layers of the atmosphere where variations in density exist.

Movies in Plane Offer Entertainment for Air Passengers

Using a projector weighing only six and a half pounds, officials of the T.A.T. air lines are now offering movies to entertain passengers in their airplanes. The above photo shows the first airplane movies ever projected. Six reels of comedy and news subjects were presented in an hour and a half during a 10-hour flight between Columbus, Ohio, and Waynoka, Oklahoma. Movies will be shown in all of the company's planes.

The latest idea for comforting the baby and making less work for mother or the nurse is the installation of a phonograph in the carriage, as shown in the above photo. This innovation has become very popular in England, where numbers of special lullabies are being manufactured to lull baby to sleep.



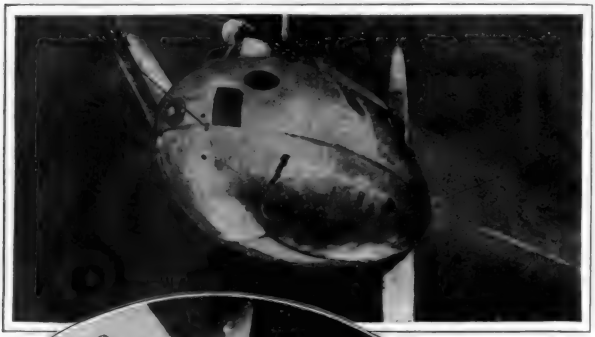
Designed to rise absolutely vertically, this novel plane was recently exhibited in England.

"Basketball Golf" Can Be Played in Your Back Yard

A combination of golf, basketball, target shooting and several other sports is the new game of "basketball golf" invented by H. C. Alston, of Los Angeles. He is shown in the picture at the right demonstrating how to play the game. A golf ball is driven with a regulation club toward a canvas backstop in which is fitted a ring similar to a basketball hoop. The object is to so place the ball that it will fall through the hoop—not at all an easy thing to do. The ball is automatically returned to the player by a device similar to that used in bowling alleys. Advantages claimed for the game are that it furnishes exercise without the need for tramping over a golf course.

400 individual lenses mounted on this rack will form the reflecting surface of the world's largest telescope. One lens will be placed in each rectangle of the lattice work. Four are shown in place.

The R101, Britain's New Airship, Passes Its Trial Flights



Five Beardmore engines will drive the giant R101. The photo above shows one of the engines mounted in a nacelle or "egg" underneath the airship. These engines will burn crude oil instead of gasoline or gas fuel as used by the Graf Zeppelin. This is expected to make the ship much safer for travel in tropical countries.

Having passed its first actual flight tests recently after being more than five years in the building, the new British dirigible R101 is being groomed for a flight to America. The photo above shows a view of the tail of the dirigible. Note that the controls have been moved farther forward on the hull than is customary. It has been found that this placement increases their effectiveness.

Major Scott, of the Royal Air Force, who will be navigator of the R101, shown in the control gondola of the airship after its first flight.

Dirigible Has Larger Gas Capacity Than Graf Zeppelin

This view of the R101 was taken shortly before it was completed. It shows the nose of the ship with the opening through which the passengers enter the dirigible open for use. The control room gondola had not been installed when this photo was taken.

Passengers sit at ease on the observation balcony of the ship, watching the ground through windows.

THE WORLD'S LONGEST SUSPENSION BRIDGE, now under construction between Washington Heights, New York City, and Fort Lee, N. J., has progressed to the stage where the weaving of the suspension cables is to be begun. Above photo was taken from the top of one of the 635-ft. towers and shows the catwalk on which four 36-inch cables will be spun. When completed the bridge will cost $60,000,000. It will be 8500 feet long, and will have eight traffic lanes.

Wing Motors to Improve AUTOGYRO

This pictograph shows a helicogyre in flight, as depicted on the cover of this month's Modern Mechanics. The helicogyre is a proposed improvement of the autogyro, with two motors mounted on the revolving wings.

RECENT successes of Juan de la Cierva's Autogyro airplane have directed the attention of aeronautical engineers to the possibilities of improving this type of machine into tomorrow's perfect airplane. The aerodynamics of the autogyro are considerably more complicated than is the case with the conventional type of plane, but various features of its design, such as its ability to descend almost vertically, are most practical.

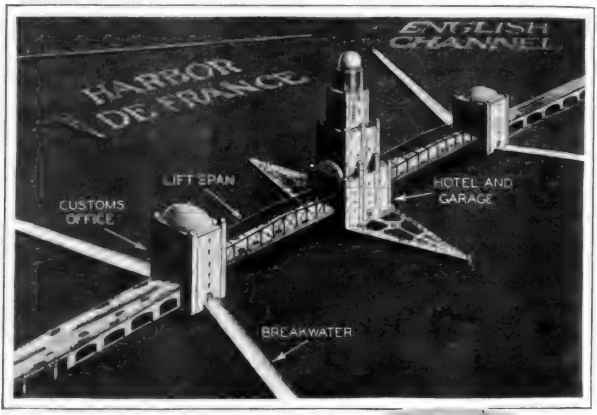
On the cover of this month's MODERN MECHANICS, Stewart Rouse has presented an adaptation of the autogyro suggested by a French designer and tentatively called the helicogyre. The principal difference from the autogyro lies in the installation of two motors in the ends of the revolving wings. In addition to this, the wings themselves are thickened and are generally of heavier construction than the companion pair of wings, without motors, which give fore and aft stability while the motored wings are parallel with the fuselage of the plane.

In the autogyro a long run on the ground is necessary in taking off, to give the rotating wings time to gain speed. As implied in the name of the machine, these wings are set in motion automatically when the plane moves forward. In the helicogyre this long take off would be eliminated, the wing motors taking care of accelerating the wings, making possible an ascent which its advocates predict would be almost vertical.

The addition of motors to the wings complicates the aerodynamics of the design somewhat. Light, high speed motors must be used to economize on weight. Such installation, however, entirely changes the principle by which flight is attained. The two small wings, resembling the lower wings of a biplane, are used more for directional control than for lifting power. Practically all of the lift is supplied by the revolving wings.

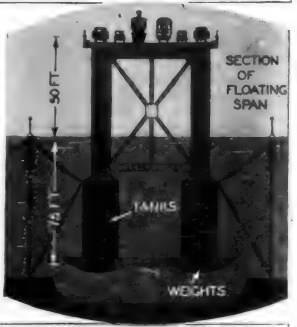
An extremely low landing speed is a feature of the autogyro which appeals most strongly to observers. The plane seems almost to hover in the air, and when it comes down in a vertical line it stops rolling almost at the instant its wheels touch the ground. If the autogyro's take-off ability can be made comparable to that of landing, the machine will have an ability to land in and rise from a back yard.

New Floating Bridge Plan for English Channel Proposed



Above is the prospectus for the suggested sectional floating bridge to link England with France.

AN UNUSUAL scheme for bridging the English Channel has just been proposed by Cleve F. Shaffer, of San Francisco. The bridge would cost $40,000,000 and is designed to meet the varied standpoints of engineering, finance and national security. The plan calls for two immense lift spans in harbors protected by breakwaters at each side of the Channel. The chief lift sections are far enough down to avoid movement by wave action. Sections of the bridge span could be raised and lowered. The plan is the least costly yet offered, is declared to be sound from the engineering viewpoint and it could be easily rendered useless in case of conflict by either France or England.

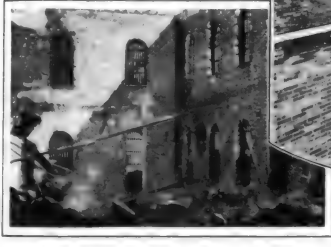


A compensating device for rise and fall of tides takes into consideration the irregularities of the channel bottom, an economy of construction, and this accounts for the rather crooked path shown.

French Prison Makes Riots Impossible

When French convicts make rare emergence from solitary confinement they are masked so they can not recognize fellow prisoners and former pals with whom to plot riots.

View of exercise pens in the prison at Fresnes, near Paris, with a masked convict in the foreground. The mask permits breathing and a downward view of the ground, making it possible to walk.



Here are the gaunt ruins of the Colorado state prison mess-hall where convicts rioted recently with the result that twelve died and ten were wounded in the uprising.

A MODEL prison has been built at Fresnes, near Paris, France, where it would be virtually impossible for convicts to plot and execute a riot such as the recent one in the Colorado state penitentiary at Canon City which was the most terrible of several recent uprisings in American prisons.

Whenever French convicts make their rare emergence from solitary confinement in the Fresnes prison they are forced to wear masks or hoods which cover their faces. The hoods permit them to breathe freely and to watch their feet for marching but prevent any possible view of fellow prisoners. In this way the convicts are prevented from recognizing former convict pals and others in confinement for stealthy plotting of jail deliveries or riots. The French prisoners are kept in padded cells and exercised in individual pens. Their work is brought to them in their cells, individual work benches being provided.

This French system contrasts vividly with the American system of providing music, movies, radio entertainment and the like for the entertainment of law violators.

Airplane Filling Stations Are Modeled After Auto Service

Photo shows London's new airplane filling station for pilots.

A FEATURE of the most up-to-date aerodrome of London, England, recently opened at Hanworth in Middlesex, is that pilots can refuel in the same manner as the motorist. A long row of gasoline pumps with elevated hose lines has been installed so that several airplanes can be fueled at the same time. The pilots taxi their ships up to the filling line just as a motorist drives up to the pumps in the modern filling station. An attendant immediately steps forward, opens the tank, inserts the hose nozzle and delivers the requested amount of fuel. The service eliminates the necessity for oil trucks on the field and provides speedy service. The Hanworth airport caters to the rich and tuition is given at moderate rates to many persons who have recently learned to fly.

Beryllium Foreseen for Aircraft

BERYLLIUM, a light metal now worth $200 a pound, is likely to find commercial utilization in future aircraft construction, Dr. W. H. Gillett, director of the Battelle Memorial Institute, Columbus, Ohio, predicts in a report to the American Electrochemical Society. Although now in the rare metal class, beryllium, on account of its light weight, a third that of aluminum, would allow decreases in the weight of aircraft. Designers have estimated that it is worth $40 to reduce the weight of an airplane one pound. Rare as the metal is today, Dr. Gillett declared it could be obtained in quantity and at a price of about $25 to $50 a pound if there was demand for it. Geologists estimate that there is as much beryllium by weight in the earth's crust as there is lead or zinc, and much more by volume. It is known to have a higher modulus of elasticity than other light metals and this property, nearly equal that of steel, promises to allow aircraft designers to use methods not now possible.

Rangefinders on Merchant Ships

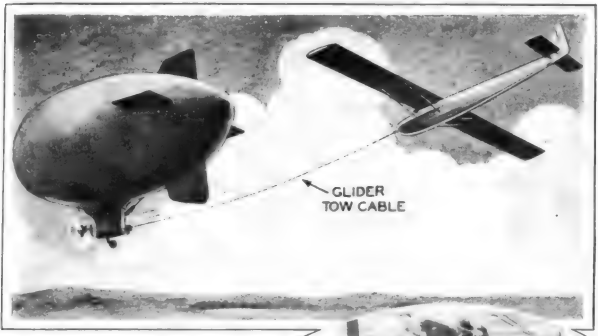
PEACEFUL passenger ships and fast cargo vessels now mount on their decks rangefinders such as heretofore have been seen only on ships of war. At the Shipping, Engineering and Machinery Exhibition at Olympia there were exhibited these new additions to navigation equipment capable of accurately determining the range of objects 500 to 25,000 yards distant.

Realistic Models Exhibited

A SANTA CLAUS wonderland on a scientific scale was the eleventh annual exhibition of models of locomotives, boats, marine engines, steam engines, tools of all kinds, tractors and electrical apparatus made by members of the Chicago Society of model engineers in Chicago.

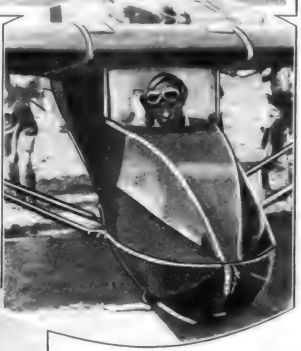
Lillian Tessmer and John Matthews' model tractor.

Small Dirigible TOWS GLIDER

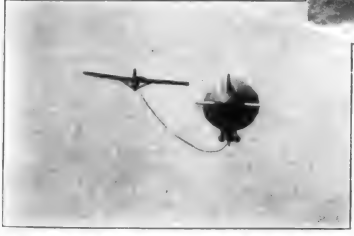


An artist's view of a dirigible towing a glider.

TWO unusual glider events took place recently at Akron, Ohio, municipal airport. One, believed to be the first of its kind ever attempted, was the successful towing of a glider by a small dirigible. The Goodyear-Zeppelin Corporation helium yacht, "Vigilant," of 86,000 cubic feet displacement, went aloft towing a glider owned by the Akron Glider Club. R. E. Franklin, professor of engineering and mechanics at the University of Michigan, was at the controls of the glider. At about 3,000 feet altitude, the towing line was disconnected, and the glider made a graceful descent to the field. A few days later, Wallace H. Franklin journeyed 160 miles, from Ypsilanti, Mich., to Akron, in another glider towed by Hugh Robbins, Akron flyer, behind a Waco plane. Although performed as stunts, the towing of gliders demonstrates the possibility of their being used as freight carriers.



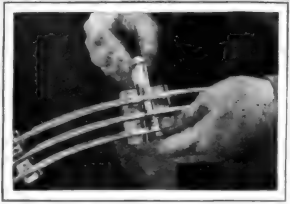
Wallace H. Franklin is shown in the glider in which he was towed 160 miles.



Photograph of the "Vigilant" with a glider in tow.

When CHRISTMAS Trains

When the train refuses to run, and the power is on, test the track first of all. The third rail may be shorted, or the pegs making faulty connections.



If the track will not carry a current, possibly the clips are shorting, or have not been properly placed. These clips for the track are important.

MINIATURE electric railroads and equipment, like other mechanical devices, sometimes get out of order and refuse to function properly. Engines refuse to run; they roll sluggishly; short circuits occur in the track system and other things arise to cause the user to wonder what is the matter. It is then that the person who understands the fundamental principles of such electric devices can quickly locate the difficulties and set things to rights again.

First of all, test the power source. If light lines are used with a transformer try turning on a light. If it doesn't light the power is probably off and the railroad isn't at fault at all. If dry or storage batteries are used test them with an ammeter or hydrometer to see if they are "up." Then make sure the transformer is switched on and all connections are tight. If the train still refuses to run the trouble must be systematically searched out and remedied.

Start with the transformer or battery connections to the track. A track connector is used for this purpose as illustrated. Be sure the wires are well clipped on and that the clamp makes positive contact with the rails. If in doubt as to positive connections test the connector by shorting the base of a flashlight lamp across the terminals. If current is passing the bulb will light. Use 2 volts of battery or the lowest transformer tap for this test.

Next test the track for shorts or dirty rails. Clean the rails with gasoline and then wipe dry. Try the train and if it does not operate test the track for shorts or open connections. Push each pair of sections tightly together so all pins and tubes make contact. If this doesn't start something then take the track apart, a section at a time, and test each one for short circuits. Place the track connector on the outside rail and remove one wire from it leading to the power source. Touch this wire to the third rail. If sparks fly that section has a short circuit. If nothing happens the section is O. K.

With the track reassembled and the power connected and turned on try the circuit by bridging from the outside rail to the third rail with any handy metal tool. Do this quickly with a wiping motion and sparks should fly. If they do the circuit is running through the tracks properly.

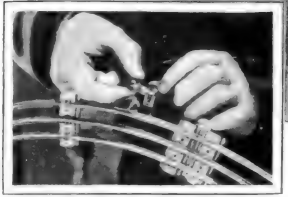
Continued refusal of the train to do its stuff indicates a probable shorted motor or open circuit.

To test for a short between the motor and the steel housing lay the engine on its side and remove the power wires from the track connector. Hold one wire on the brass collecting shoe as shown and touch the other wire to a bright part of the metal housing. The motor should spin. If it does not then there is a shorted motor winding

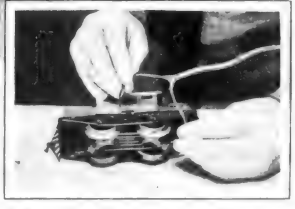
Stop RUNNING

Be Your Own Repair Man

by L. B. Robbins



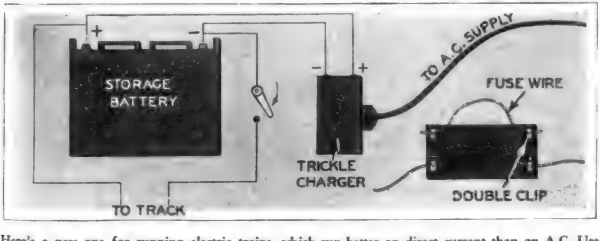
The current may be short circuited in the track lead-ins. These are of fibre with soldered connections, which may have broken.



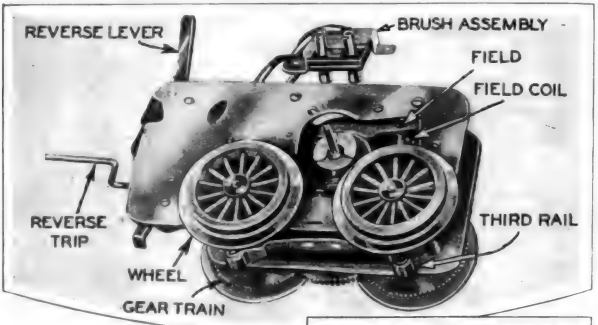
The "juice" may be shunted through the motor frame by a short circuit instead of to the motor. Test this out with small voltages.

or open lead. Wipe off the collecting shoe with gasoline.

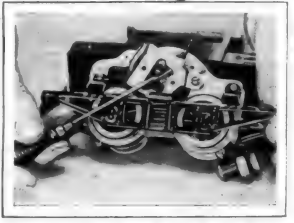
If you suspect the motor brushes remove the housing from the motor. At the same time inspect all exposed wiring and tape any bare spots. They will surely cause shorts. When the brush supports are exposed the brushes may be removed. Each brush is held against the commutator through a metal tube and held down by a spring. To remove the brush, lift the spring with a small tool and the brush can be dropped out. The entire brush plate may be taken off by loosening the two holding screws. If brushes are worn short replace with new ones and be sure the spring holds them firmly against the commutator. Inspect the brush wires and all internal connections.



Here's a new one for running electric trains, which run better on direct current than on A.C. Use the radio trickle charger to keep the battery going, and run the train on D.C.



The parts above enumerated may be prolific causes for the non conduction of current. See that the wheel flanges are clean; use gasoline to clean the third rail roller, and look to it that the commutator segments are dry (not gummed with oil) and that there are no loose wires and bared parts.



The brushes, fine gauze pillars set in spring sockets, often become gummed and should be brightened up with sand paper, and oiled with a drop of very fine oil.

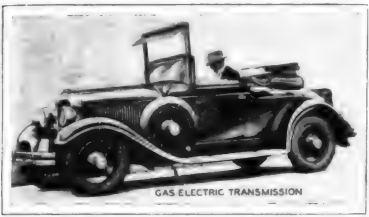
To oil an electric train use only the very best grade of light oil and use sparingly but often. Cheap oil will gum up quickly and block the electric circuit. Use a drop at a time on a straw or small wire. Clean collection shoe with fine sand paper when necessary as well as the flywheel flanges. These are the collectors for the current to the motor.

The usual short in a track section is because the fibre insulation under the third rail and the metal tie has cut through and allows the two parts to touch. If this is found to be so, remove the old insulator and put in a new one. This should remedy that trouble. Test out before reassembling the track. In reassembling push all track pins well home and then force the metal clamps connecting sections firmly in to prevent the sections from opening up and breaking the circuit. If track sections fit together too loosely pinch the open ends with a pair of pliers so the pins will push in tight.

Clean commutator under the brushes with a cloth moistened in gasoline and wipe dry. *Do not oil.* With all connections tight, shorts and bare spots taped and brushes and commutator properly adjusted the motor should spin when the wires are connected as previously described. If it runs this way it will do the same on a live track.

The accompanying diagrams illustrate the various methods of connecting and applying power to the railroad system for best results. No matter what type of power is used, however, use only enough voltage to give the desired speed. More power tends to shorten the life of the motor and accessories. If a storage battery is used the radio trickle charger can be handily utilized to keep up the charge in the battery so it will always operate efficiently. The farm lighting plant can be used nicely by tapping off from three or more cells as shown.

No Gear Shifting in This Car

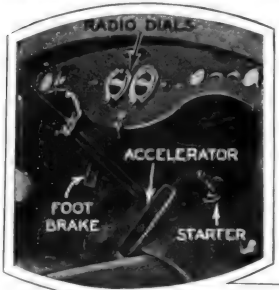


As shown in the above photo, Col. Green's gas-electric car does not differ outwardly from any automobile, except that he has installed a special windshield for his own convenience. The electric drive of the car is concealed beneath the floor.

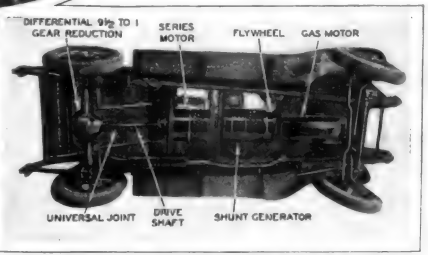
AN automobile which has no clutch pedal and no gears to shift has been built for Col. Edward Green, wealthy son of the late Hetty Green. The novel control system of the car is made possible by substituting a generator and an electric motor in place of the usual transmission. The flywheel of the gasoline motor drives the generator, which supplies current to the electric motor which propels the car.

There are but two foot pedals, one to the left for the brake and another for the accelerator. It is impossible to kill the engine without actually shutting off the ignition, and it is impossible to start with a jerk. Even though the accelerator is jammed quickly to the floor board, the pick up will be smooth and gradual. When driving the chauffeur can keep both hands on the wheel and his eyes on the road at all times.

The gas engine of the car is of standard make and was not altered in any way. By stepping on the accelerator the gas engine is speeded up as in any car, and the increased speed turns over the generator at a higher rate and a proportionately stronger current is fed to the electric motor, resulting in greater speed for the car. This arrangement entirely eliminates jerky starts common to clutch and gear transmissions.

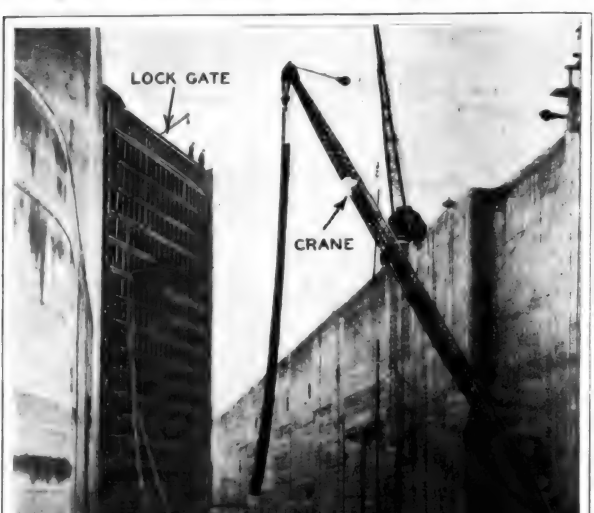


An interior view of the car is shown above. Note that there are only two foot pedals, one controlling the accelerator so that the feet need not be shifted when maneuvering the car. Radio dials in the dashboard control a loud speaker which can be seen just above the starter button. The slight bulge in the floor is caused by the generator, which takes the place of the transmission case and is operated by the flywheel of the gasoline motor. Only three motions are required to set the car moving.

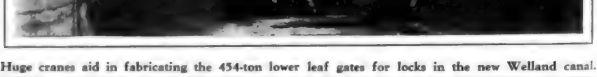


Disposition of the various electrical units of the car is clearly shown by the above photo of the car. Note short length of the drive shaft.

New WELLAND CANAL



Huge cranes aid in fabricating the 454-ton lower leaf gates for locks in the new Welland canal.



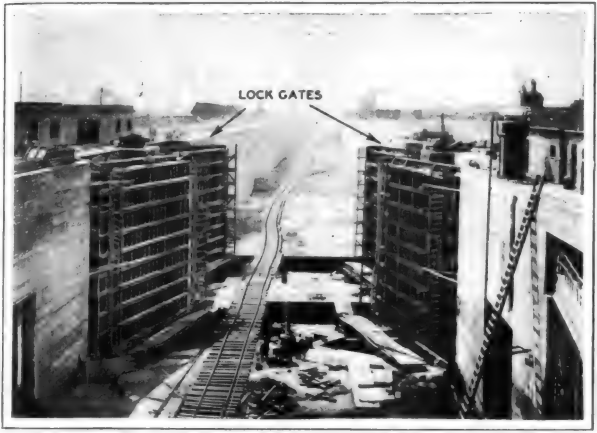
Elevation showing Lake Erie, guard locks, and deep cuts necessary in construction of deep canal.

By EARLE W. GAGE

AFTER more than three centuries of endeavor to connect the Great Lakes with the sea, modern engineering skill is making a real achievement in completing the Welland Ship Canal across the Niagara Peninsula, connecting Lakes Erie and Ontario.

A series of locks will step ships up or down, the 326½ feet between the lakes. The project involved construction of the longest lock in the world, and locks with greater lift than those of the Panama or Suez. The canal, the third Welland Canal

LIFTS SHIPS 326 FEET



Looking down the world's longest canal lock, 1,380 feet, a part of the new Welland ship canal.

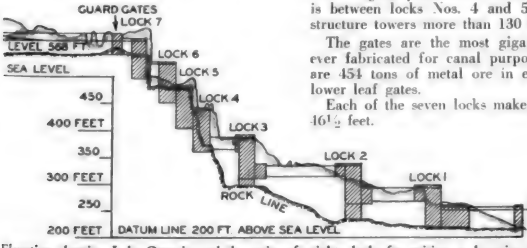
to be built since the first was conceived in 1824, will cost about $120,000,000.

The canal will permit passage of the largest lake vessels. It is 25 miles long.

In addition to the seven lifts, aside from the guard lock, at the entrance, known as No. 8, three of the locks are twins, permitting two ships going in opposite directions, to be put through at the same time without loss of time. The twin locks are similar to those used at Gatun, in the Panama Canal. While the Gatun locks have an 85-foot lift, those in Welland have a lift of 139½ feet. They are 820 feet long and 80 feet wide. At the highest point in the lock walls, which is between locks Nos. 4 and 5, the huge structure towers more than 130 feet.

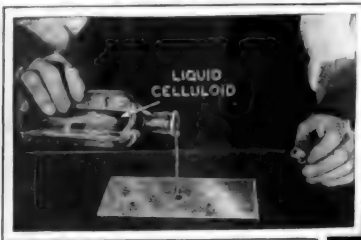
The gates are the most gigantic affairs ever fabricated for canal purposes. There are 454 tons of metal ore in each of the lower leaf gates.

Each of the seven locks makes a step of 46½ feet.



Elevation showing Lake Ontario and the series of mighty locks for raising or lowering lake vessels.

Transparent Wrappers for Packages Can Be Home-Made



Liquid celluloid poured and spread thinly on a glass plate to dry will become transparent sheet.

THIN, transparent, waterproof wrappers for covering packages intended for gifts may be easily and cheaply made at home, giving a truly cosmopolitan appearance to gifts. A thin, liquid celluloid is made by dissolving strips of clear celluloid in either ether and alcohol or amyl acetate. Coloring matter may be added at this stage if desired to increase its attractiveness.

Celluloid sheet being stripped from glass plate.

Coal Delivery in Paper Boxes

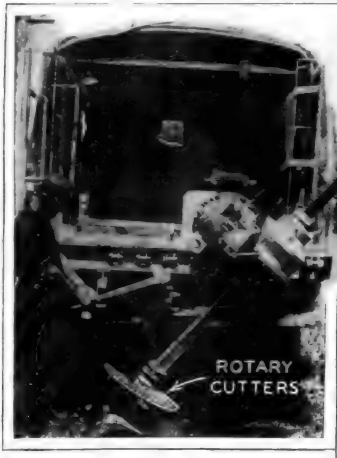
A MOST approved method of coal delivery are these heavy composition boxes which have been adopted by a Chicago coal company in an effort to eliminate the dust arising when delivery is made in cloth bags. The square shape of the boxes aids in packing them on the truck and they are a part of the standard equipment of the truck. The boxes aid in making fast delivery.

Coal carriers unloading boxed coal from truck.

Blindfold Tests for Pilots

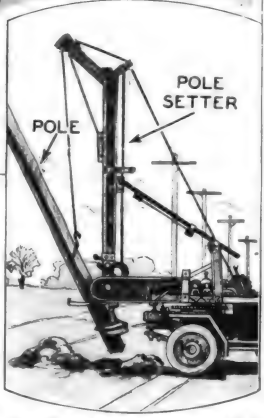
ONE reason why aviators so often lose themselves completely in a fog, possibly a clue to what became of some of the flyers who have taken off across the Atlantic never to be heard from again, is supplied by tests of blindfold flying made recently at Langley Field, Virginia, for the National Advisory Committee on Aeronautics. Blindfolded pilots fly, it was found, in spirals instead of straight lines, just as men walk in similar spirals when blindfolded or when lost in a forest. For these tests the airplane had dual controls, with the blindfolded pilot in one seat and a reserve pilot in the other, ready to take charge if the blindfolded pilot got into serious trouble. In every instance the blindfolded pilot, after flying for a little while in a straight line, began unconsciously to turn his airplane into a spiral path. In the absence of reliable instruments and without sight of landmarks, a pilot in actual flight might do the same; perhaps circling over a trackless ocean in an ever-narrowing spiral until his gasoline was exhausted and his airplane fell into the sea.

Machine Digs Holes for Telephone Poles at Great Speed



New earth boring machine on the auger principle is attached to end of a truck and digs holes at top speed.

A NEW type of earth-boring machine has been developed that is speeding up to a remarkable degree the setting of poles. The auger is manipulated on the same principle as that employed by the carpenter when boring through wood. The auger is let into the ground until it has a full load, then it is raised above the ground and the dirt removed from it by centrifugal force. This operation is repeated until the hole is dug the desired depth. The time required for digging a hole by this method is two minutes under ordinary conditions to five minutes when boring through tough shale. The pole is raised into position, the hole is dug and then the pole is dropped into place and solidly tamped.

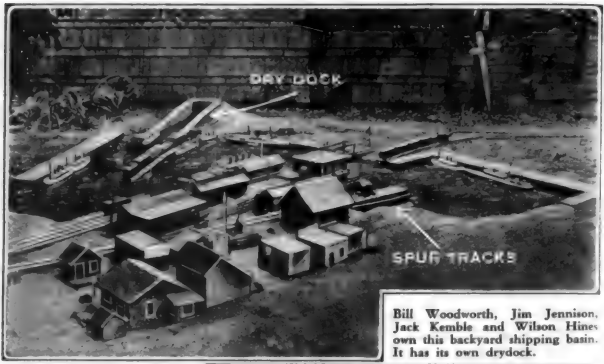


Telephone poles are hoisted up and set in holes speedily with new equipment attached to end of truck.

Mouse Empire Rises and Falls Every Four Years in Great Britain

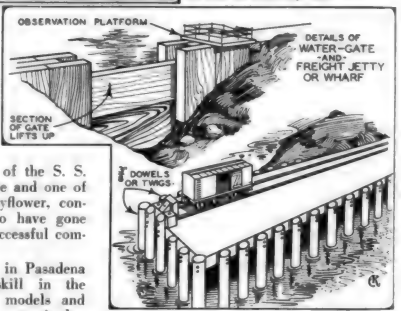
THE mouse population of Great Britain ebbs and flows every four years like a gigantic animal tide; which is fortunate for ten years of uninterrupted increase would enable a dozen or so pairs of mice to people the country with more than a thousand billion animals. The discovery of the cycle was explained before the recent conference of Empire Meteorologists, in London. Starting with a year of relatively few mice, the mouse population increases rapidly at the beginning and then more slowly to the top of the cycle. Disease then appears and the mouse population rapidly declines.

Model Harbor for Toy Ships



Bill Woodworth, Jim Jennison, Jack Kemble and Wilson Hines own this backyard shipping basin. It has its own drydock.

ALTHOUGH Pasadena, California, is thirty miles from the nearest seaport the young men of this city have developed such great interest in ship models that their work is becoming known all over the country. Notable examples are the $2500 model of the S. S. Malolo in the Honolulu service and one of the president's yacht, the Mayflower, constructed by two brothers who have gone into the business on a very successful commercial scale.



High and low tides are simulated with the small board lock dam shown above. The method of building the piers used in the "American Mercantile Marine Corp." are also shown.

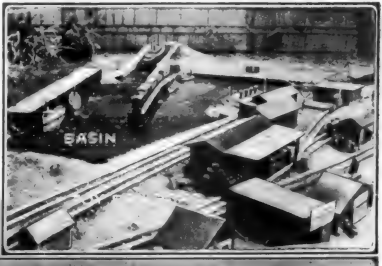
Many groups of other boys in Pasadena display more than average skill in the building of these interesting models and four young men have actually organized a club, "The American Mercantile Marine Corporation" for the study and construction of miniature steamships. These boys, Bill Woodworth, James Jennison, Jack Kemble and Wilson Hines, average 14 years in age and gravitated together through their mutual interest in things nautical.

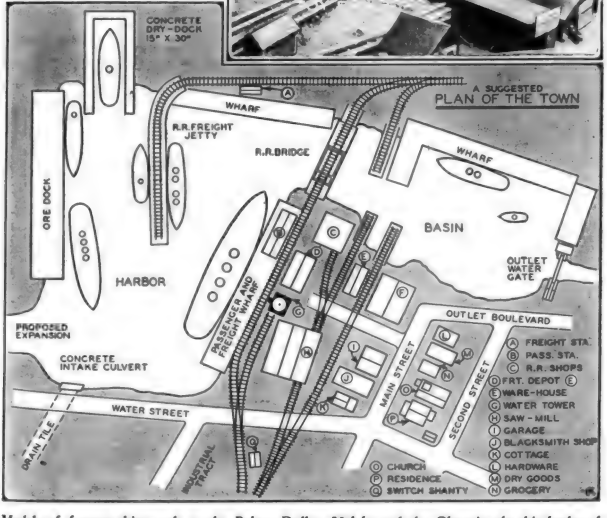
Their fund of knowledge of shipping covering the past hundred years is amazing. The club library contains huge scrap books with thousands of photos and clippings of past and present steamships, and any one of the members is able to give detailed specifications and nature of service of practically any ocean going steamship.

An irrigation ditch in the orchard at one of their homes furnished the inspiration for an ocean within backyard limitations,

and here they try out their model ships. A seaport town has been built, with wharves, jetties, docks, depots, stores, shops and houses. A vast railroad system serving the port has been laid out with several hundred feet of track, and two locomotives and over fifty cars are included in the system which is complete with switches, spurs, bridge, semaphores and crossing gates. The buildings and signals are electrically lighted.

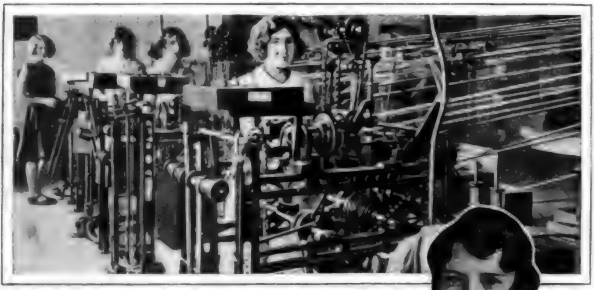
There is a concrete drydock large enough to accommodate a 22-inch liner. Cargo is hauled to shipside in the trains, transferred to the "bottoms" and shipped on the high seas. After a vessel has been in service for a certain period she is withdrawn and sent to the drydock for overhauling. Water is fed to the "ocean" through underground tile and tides are controlled by a water gate.





Models of famous ships such as the Robert Dollar, Malolo and the Olympic ply this backyard ship harbor. Cargo is hauled to shipside via rail, transferred to "bottoms," and shipped for high seas.

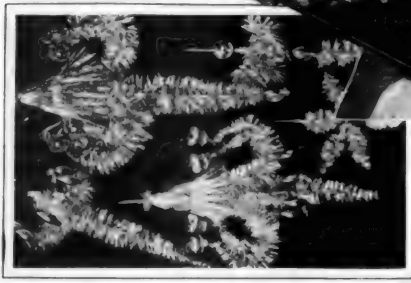
Silver and Copper Used for Christmas Tinsel



These machines consume an average of 2,700 miles of tinsel thread daily in making Christmas tree tinsel garlands. Six miles of the delicate tinsel thread weigh only one pound.

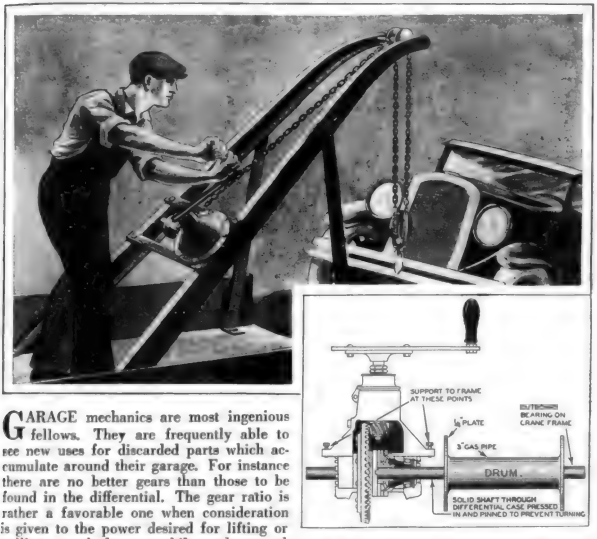
FEW persons know that the sparkling garlands for Christmas trees are made from silver-plated copper wire. In manufacturing processes a copper ingot is rolled into a wire ⅜-in. thick. By drawing through steel dies this copper rod is reduced to a diameter of 3/16 to ¼-inch in diameter and plated with real silver. The wire is then drawn through diamond dies and finally it emerges three-thousandths of an inch in diameter. High speed rollers flatten this almost microscopic wire, at the same time imparting a high lustre. The tinsel is made in America.

Girls attain amazing speed in assembling these fragile ornaments.



Five thousand of such stars, foxtails, clusters, etc., are produced annually in one factory alone to decorate American Christmas trees. The ornaments are made from miles upon miles of silver-plated copper thread.

Wrecking Crane Can Be Built Up From Differential Parts



The above drawing shows how parts of old differential have been mounted on a framework to make a satisfactory automobile wrecking crane.

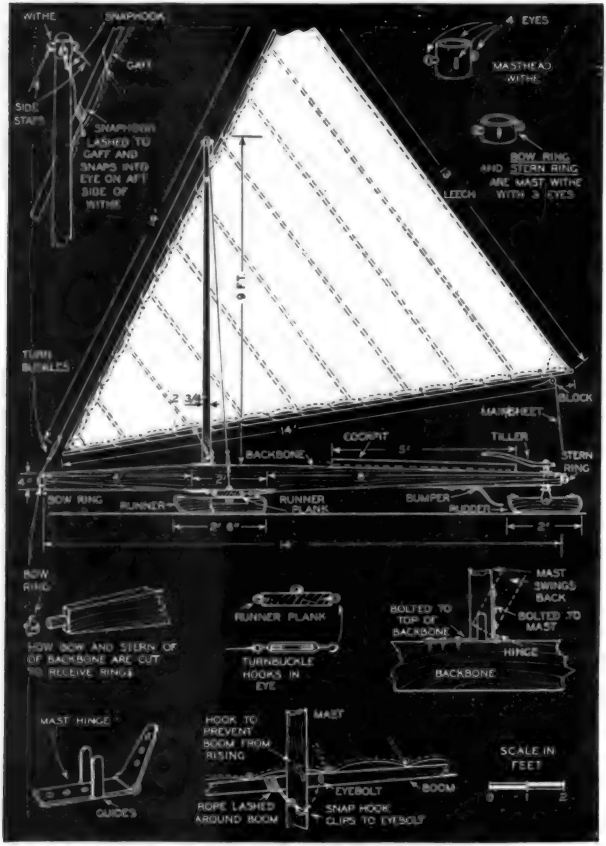
GARAGE mechanics are most ingenious fellows. They are frequently able to see new uses for discarded parts which accumulate around their garage. For instance there are no better gears than those to be found in the differential. The gear ratio is rather a favorable one when consideration is given to the power desired for lifting or pulling wrecked automobiles; the usual ratio being about 4½ to 1.

The side members of a car frame have ample strength and the desirable form for building a crane. The drawing above will give an idea of how to set up sections of this frame and bolt them together to form the frame for a wrecking crane.

As a rule these wrecking cranes are mounted directly into the rear of the wrecking car, being bolted to the body sills. When laying out the frame for the wrecking crane, run on two cross members at the front so that a used differential may be mounted as suggested. Remove the spider and side gears from the differential, substituting therefor a piece of pipe or other metal which will act as the core of the drum for lifting. This gear will need to be supported at its outer end only, the differential itself forming ample support at the inner end, where the gear is fitted to it. For the handle of the device bolt a piece of ½"x1½" flat steel across the universal flange. Fit a steel handle by means of a bolt to the outer end. This handle may be made adjustable if desired.

Possibly the best thing to use for attaching to the wrecked car or work to be done is a square linked chain. This may be purchased from the automobile supply house or mill supply house. Figure the length desired for the work at hand. In order to increase the lifting power it may be desirable to use a block. The more strands on this block, of course, the greater the power. For ordinary work the arrangement of the block and chain suggested in the sketch will be sufficient. Dimensions will vary according to the materials at hand.

The Blueprint Below Details Accurate Iceboat Construction Dimensions



This blueprint gives you the details and appearance of a speedy, compact, knock-down, iceboat described by Mr. Robbins, a craft that can be constructed easily at a moderate cost.

HOW to MAKE YOUR OWN Take-Down Iceboat

Here are full plans for construction of a compact, take-down, speedy little iceboat which can be simply made at a minimum expense and easily transported to your favorite lakes for great winter sport.

By L. B. ROBBINS

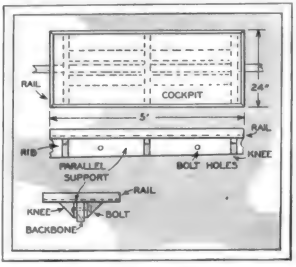
THE sport of iceboating never grows old. But designs improve to keep up with the times and here is a complete boat of up-to-date model that can be taken down, transported on an automobile and reassembled in a very short time. Think of that! Take your iceboat where you wish and bring it home when you have had your sport. This craft is necessarily small and designed for one person but, by widening the cockpit it will accommodate two although the extra weight will cut down its speed somewhat. All rigging, sail plan, etc., has been reduced to extreme simplicity so the average boat builder will have no trouble in constructing it and so the expense will be at a minimum.

The hull consists of the backbone and runner plank. The backbone is fashioned from a 14 ft. length of spruce 6x2 inches. The bottom is left straight but the top edge is tapered towards each end. Four feet from the bow taper to 4 in. wide. Eight feet from the stern taper to 4 in. wide. That leaves a 2 ft. section at the mast step 6 in. wide. Then cut bow and stern ends into a 2 in. pin 2 in. long to receive the rings for holding runner plank stays. Bore a ¾ in. hole vertically through the stern 6 in. from the end for the rudder post. Then 4 ft. 6 in. from the bow fit the mast step. This is shown in detail and consists of a flat steel plate about 6 in. long bolted to the top of the backbone. This plate has two upright legs that guide the mast from side slipping and is then hinged at the rear to a second 6 in. piece of steel that bolts to the rear of the mast butt. This allows the mast to be tipped back or raised vertical at will.

Just back of the step bolt two channel irons vertically to the sides of the backbone as detailed. By using the same bolts and boltholes they can be lined perfectly. The irons can be easily made by splitting iron pipe, flaring out the sides and drilling for bolts. The channel should be capable of taking a ½-inch bolt.

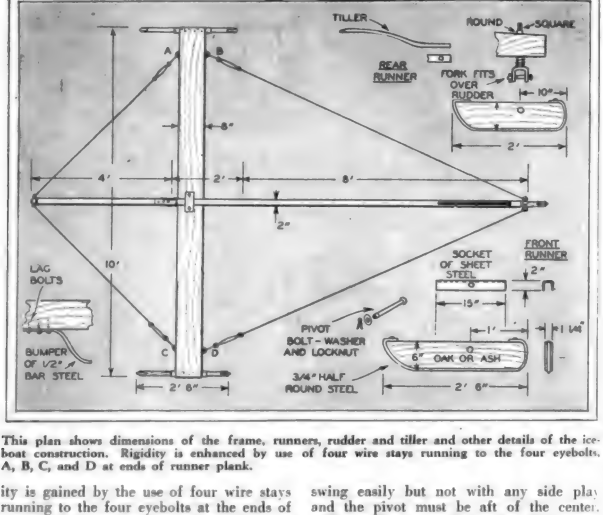
The runner plank consists of a 10 ft. length of 8x2 in. spruce plank, slightly bowed on the flat. Use the convex side uppermost. Through the exact center, to coincide with the pair of channel irons on the backbone, are projected vertically two ½-inch bolts 8 in. long. Then at each end of the runner plank, underneath, bolt a piece of square channel iron 15 in. long for the runners. They should measure 1½ in. wide inside and drop down about 2 in. with a hole drilled through both sides for a bolt, washer and cotter. The two irons must be exactly parallel and at right angles to the ends of plank.

The hull is assembled by setting the backbone over the runner plank at right angles, pushing the bolts through the channel irons and then laying a lock plate of heavy steel over the bolt ends and fastening down with two large wing nuts. This is shown in detail. When bolted up tight the structure will be quite rigid. Further rigid-



Here is detail for building the snug cockpit.

Frame of Knockdown Iceboat Consists of Backbone and Runner Plank



This plan shows dimensions of the frame, runners, rudder and tiller and other details of the iceboat construction. Rigidity is enhanced by use of four wire stays running to the four eyebolts, A, B, C, and D at ends of runner plank.

ity is gained by the use of four wire stays running to the four eyebolts at the ends of the plank. Turnbuckles are used at the plank eyes, but the other ends of the stays are connected directly to two metal rings fitting over the pin shaped ends of the backbone. These rings are mast withes, purchasable at any ship chandlery. They should be provided with three eyes, leaving the middle eye uppermost. When the stays are properly connected as diagramed and the turnbuckles drawn up, your hull will be as rigid as iron.

The pair of forward runners should be constructed of oak or ash $1\frac{1}{4}$ in. thick by 6 in. wide. Cut the shape indicated and shoe them with half round steel rod sunk slightly in a groove in the edge of the wood. Fastenings are to be made at each end with long screws as shown. Then file and grind the running edge of the runner to a right angled V. Bore a hole to coincide with those in the runner channel irons and pivot in the irons with a strong bolt, locking with washers and a cotter pin. They should swing easily but not with any side play and the pivot must be aft of the center.

The rudder is made similar to the runners except it is 6 inches shorter. Bore the pivot hole slightly to the rear. Then fit the rudder post which is a piece of $\frac{3}{4}$-in. galvanized pipe fitted to a fork that straddles the rudder and pivots to it with a bolt, washer and cotter. A spiral spring should rest on the shoulder of the fork and against a washer under the backbone. This takes up jarring of the rudder and eases steering. The top of the rudder post should be heated red and pounded square. Then a tiller can be fitted as suggested with a square hole to fit snugly on the top of the rudder post. When the rudder is in position a bumper made of heavy bar steel must be bolted to the under side of the backbone as shown to take the shock off the rudder whenever a heavy bump or obstruction is encountered on the ice.

The pilot reclines in a shallow cockpit straddling the after part of the backbone. This can be made of light matched

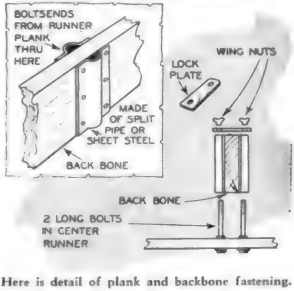
boards and is 5 ft. long by 2 ft. wide. edges with a slightly raised safety rail. Nail the board to at least three strong cross cleats. Then bolt two pieces of 2x4 across these, running lengthways of the cockpit and exactly down the center. Space them so as to make a snug fit over the edge of the backbone. Brace them each side with three knees or angle irons. Push down over the backbone in the suggested position and then bore two holes through both timbers and the backbone itself. Two bolts will then serve to secure the cockpit rigidly to the backbone.

The mast and spars can best be fashioned from clear well seasoned spruce. The mast is 9 ft. long, 2¾ in. at the butt tapering to 2 in. at the tip. Both spars are 14 ft. long, 2 in. in the middle and 1½ in. at the ends. Turn them down with a spoke shave or plane, then finish with a smoothing plane and finally sandpaper, and varnish. Fit the mast top with a 4 eye withe and bolt the butt to the mast step. Twist a stay to the forward eye, fitting the bottom with a turnbuckle which is then hooked into the top eye of the bow ring. Then the two eyes on the sides of the mast tip are stayed similarly to the two eyes in the ends of the runner plank. Take up on the turnbuckles until the mast stands plumb and steady.

The sail measures 14 boom, 14 ft. gaff and 13 ft. leech. Make it of 18 in. widths of light duck, double stitching the seams. Also double stitch the edges and sew in strengthening triangles in the corners. Place lacing grommets at all boom and gaff seams and midway between them. Lace the sail to boom and gaff as shown, starting at the forward ends and ending at the tips of the spars where the ends of the sails should be pulled only lightly until stretched. As will be noticed, the widths of cloth are parallel to the leech.

The boom lashing consists of a short piece of strong rope lashed several times about the boom with a free end about 8 in. long to which is fastened a snap hook. This passes snugly around the mast and snaps into an eye in the boom about 6 in. aft of the lashing. A down turned hook on the mast prevents the boom from rising. This lashing should be so placed that the forward end of the boom comes about 3 in. back of the bob stay.

Then attach a snap hook to the gaff in a similar manner and in such a position that it will snap into the after eye on the withe and pull the sail taut.



Here is detail of plank and backbone fastening.

Lash a pulley to the end of the boom and reeve a piece of sash cord through it for the main sheet. Fasten one end to the top eye of the aft backbone ring and use the other end to control the trim of the sail. Such a Lateen rig is simple to make, is an excellent sailing rig and is comparatively inexpensive.

Your iceboat is now practically complete with the exception of a coat of paint or oil and the little refinements such as cleats, etc., for fastening bow line, sheets, etc. To take it down for transportation is a simple matter. All you need is a wrench. First loosen the mast stay turnbuckles, unhook the forward one, release the boom snap hook and the mast can be lowered down aft, bringing the sail with it. Then release the runner plank stays, slip off the stay ring from the backbone, take off the wing nuts and lock plate from the plank fastening and lift the backbone from the plank. The runners can be removed from the timbers by merely removing the pivot bolts if desired. By removing the two cockpit bolts that can also be removed. Assembling the craft is merely a reversal of this process.

With a nice fitting sail and sharp runners this little ice boat will sail fast and prove a good stable boat. With it built in this knock-down manner you can easily transport it to any suitable lake where the ice is the best and thoroughly enjoy yourself and bring it home with you at night.

How to Use Your

Proper understanding of balance and leverage pertaining to lifting, shoveling, etc., will save the average person many a back ache.

Illustration 1—The man at the left is letting his leg muscles do much of his work while the man at the right above is overworking his back.

By ROBERT GREGG

A DAY at sand shoveling teaches the average man many things. He learns of the law of leverage, he becomes acquainted with the balanced weight, he masters the correct manner of lifting a wheelbarrow—in short, he gets to know his muscles; he learns to use them correctly.

Every person knows that his shoulder and leg muscles are the strongest in his body . . . yet . . . the average man will usually attempt to lift a heavy weight by bending from the waist, with legs straight. The weight is thus placed at the end of a long lever with a fulcrum at the hips; the arms and comparatively weaker pelvic muscles are forced to do the lifting; and the mechanical disadvantages are terrific.

If the weight is lifted in the correct manner, you will squat slightly with the back kept fairly straight, grasp the object, and then straighten up. As a result, the whole work is correctly done with the legs.

In illustration No. 1 notice how the man in the foreground is stooped over, unbalanced, his abdominal muscles forced to make the lift. The man in the background is doing the task correctly: The legs are bent, the weight is close in and perfectly balanced, the back is bent at a normal angle. The lift, therefore, is done entirely with the heavy leg muscles.

The girl's body is improperly balanced with feet advanced, making it difficult to arise from chair.

The man who carries a twenty-pound weight in each hand really carries far less than the man who carries one thirty-pound weight using one hand only. The reason is—balance.

Of course, it is not always possible to balance the weight. In that case, get the weight on top of your body if it is at all possible. A sack of flour or cement, a small

Muscles CORRECTLY

Illustration 2—**The man at the left has hands far apart and the left knee is doing much of the work of correctly shoveling sand. The man at the right is losing valuable leverage and making his work unnecessarily difficult.**

box, a plank, and like articles should be carried across one shoulder. If the object to be lifted or moved cannot be conveniently shouldered, you should apply the trunk lifter's trick of trundling a weight around on the knees. Lifting in this manner may be a bit slow, but it puts the strain where it belongs—on the strong leg muscles.

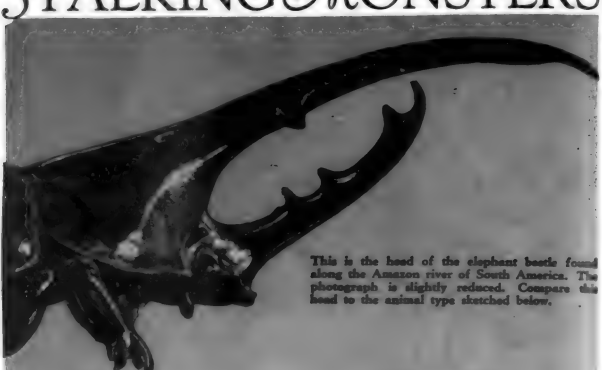
Always use the leg muscles. It may sound simple enough, yet few persons really do. In getting out of a chair, for example, the average person will place his feet far in advance of his body, and then compel the comparatively weaker arm muscles to lift the body from the chair, as shown in the photograph. If you will tuck your feet well under your body when about to rise, you will find that the mere action of leaning forward and straightening the leg will bring you upright.

The shoveling of any loose material brings us to the law of leverage.

Illustration No. 2 pictures at the right one way to shovel sand. The shovel is sunk into the sand bed with a short jab from the arms. The left foot then takes a step forward. The body is stooped to take up the weight; and the left hand slips down the shovel handle for additional leverage. The lift is made. This is the correct way to shovel sand. The arms are always held quite far apart; the stance is stationary with no forward step; and the left knee does most of the work by sinking the shovel into the sand.

This trunk lifter correctly places the weight on his knees and saves his back.

STALKING MONSTERS



This is the head of the elephant beetle found along the Amazon river of South America. The photograph is slightly reduced. Compare this head to the animal type sketched below.

A NUMBER of stalking giants of the insect world have recently been discovered by entomologists in the Amazon river jungles of South America and other seldom penetrated places. They have discovered rhinoceros beetles with heads nearly as large as a man's hand and protruding horns and tusks that make their heads resemble the head of the rhino. They have found the great elephant beetle with horns that make their beetle heads amazingly similar to the head of the elephant with tusks and trunk.

These monsters of the insect kingdom live in a world with other strange and little known insects with a startling ability to change their form and color to resemble their surroundings. So complete, in some instances, has been this insect ability to look like something else, that it was not until very recently that scientists have been able to even find them. Many have not been classified or even placed in museums. Arthur H. Fisher, recently returned from long months in the jungles of New Guinea and the Amazon Basin of Brazil, captured, after long patient watching, a few samples of these imitative creatures hitherto unknown to modern man.

Pushing his way through the tangled growth of the tropical forest he was surrounded by countless strange and wonderful creatures, some of them minute, but many true leviathans of the insect world. Watching closely he would occasionally see a large twig separate from its neighbors and walk away in the most mysterious manner.

of the INSECT WORLD

A Story of the Amazing Tropical Bugs and Beetles

by UTHAI V. WILCOX

Above is pictured the head of the rhinoceros beetle as found in the Amazon region. The picture is slightly smaller than the actual size. Notice the similarity to the animal type below.

Then again, he would see a green leaf suddenly become an animated thing and fly away and attach itself to a nearby group.

Under such circumstances if he moved quickly, he could capture a rare "walking-stick" and the leaf might prove to be another species of the same group, or perhaps a katydid with a camouflage complex developed beyond belief.

The restless native or the untrained observer moving through the tropical growth would easily pass by grasshoppers and katydids as large as finches, or other birds, or walking-sticks a foot in length, and all within the grasp of his hand, yet be absolutely unaware of their existence, so perfect is the insects' ability to simulate a leaf or twig.

Such miracles are only possible in the tropical jungles and could never happen in our own temperate zones. The warm regions around the center circumference of the earth are ideal for the growth of insects. There is no winter, no spring and no fall. There is only perpetual summer. Every day is like every other day and every tomorrow will be like yesterday. Under such conditions, harmless and the dangerous insects develop along gigantic lines.

The fighting bugs are generally not so numerous as they are aggressive, according to this naturalist. They have a high degree of efficiency and are one hundred per cent prepared to battle, and thus wage constant warfare on man.

But in the tropical forests there are hundreds of insects that are shy and retiring and do not intrude themselves upon man. They hide by imitating the growths all about them and for this reason they are rarely found.

Belgian Congo Grasshoppers Are Large Enough to Capture Stray Mice

A giant grasshopper is shown handling a large twig. Some of these grasshoppers grow large enough to kill mice. This is an actual photograph of the grasshopper with a mouse sketched by an artist.

Mr. Fisher says that he has seen a huge butterfly, whose upper wing surfaces reflect the fleeting lights in gorgeous colors, suddenly alight with folded wings against a background of neutral browns, to appear instantly as a dead or dying leaf, or even perhaps strikingly to mimic some forest creature feared by enemies of the butterfly.

This remarkable sense of simulation and mimicry and ability to camouflage and fade into the distinct backgrounds of their chosen environment is their best protection both from devouring by their enemies and even from capture by man.

A katydid may pause amid the brilliant green leaves of the bush it is equipped by nature to imitate, there to remain motionless, its antennae extended to the branch, to simulate further the tendrils of the true leaf it seeks to portray. Color texture and even the delicate and intricate veins of the adjoining leaves are reproduced.

Possibly the most unusually successful of the imitative insects is the leaf-like walking stick from Ceylon, aptly named *Phyllium pulchrifolium*, which is the last word in leaf camouflage, where even the legs are elaborately curtained with pale green pseudo-foliage.

The grandfather of all the walking-stick family, the giant *Cladomorphus*, comes from the Amazon basin of Brazil, and attains a length of twelve inches. Yet so perfectly does this weird insect resemble and mimic the stems of the plants on whose foliage it feeds that but few collectors have ever brought back an adult specimen.

Another giant of this grotesque tribe is the spiny horrida variety from New Guinea. This ugly, but wholly harmless insect wisely uses its spiny protective garb in accordance with the first law of Nature, selecting its home in the forest among spiny and formidable surroundings.

The fields of nature are filled with curious bugs of prey. All the fierce animals well known to man have their similar types in bugdom except that many of the latter are much more cunning.

Where in the animal kingdom will one find anything like the praying mantis, which receives its name from the habit of sitting erect on a twig, motionless for hours, with its front legs clasped together as if in an attitude of prayer? Thus it awaits its prey. Because of its ability to sit like a part of a branch or dried leaf it catches its prey and devours ants, caterpillars or other insects that come within reach. Another known as the rearhorse is, too, a large insect, very uncommon and rarely seen, because it is very much like the foliage in color.

In Java and elsewhere in the Malay Archipelago there is a related species of which little is known but also a great imitator and deceiver, but it is called the diabolical specter. It is one of the most beautiful of insects and perched in the middle of a flower cluster of which it appears to be the most beautiful part, it waits for a butterfly or other prey to alight.

In the Belgian Congo there is a great grasshopper of giant size and from meager

reports it is claimed that it will catch mice and other small creatures. No less remarkable is the Drilus beetle. The female stays in a worm form. The grubs are very hairy, many-clawed and have powerful jaws which are used to attack and devour snails. It can hardly be found when seeking protection in the jungle masses.

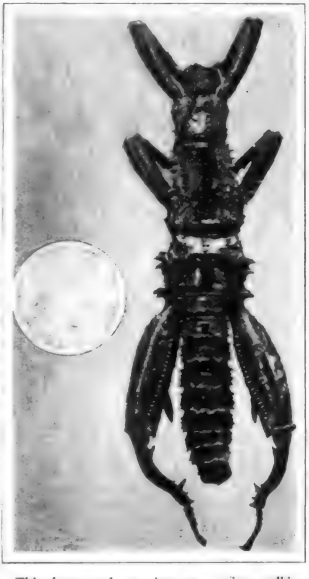
Very little is really known of the life histories of these and other tropical giants. More is known of those African relics of the *Pleistocene*—the elephant and the rhinoceros—but beyond the fact that they feed on foliage and will not bite immediately, there is practically nothing known of the giant elephant rhinoceros beetles of South America but recently photographed by Mr. Fisher.

This naturalist says that you can ask the most erudite entomologist or even the specialized student of the *Soleoptera* to which great division of insects these species belong, and he cannot tell you why these huge beetles evolved such imposing horns. He may suggest that they use them to cut off foliage for food, but we find that these horns are covered with a delicate complement of fine hairs which would never withstand such hard usage.

Nobody knows just why the katydids talk so much, disputing as to whether Katy did this or Katy did that. Some have thought it was a language of mating but even this cannot be proved because some of the great tropical katydids have no musical ability at all.

These are but a few of the mysteries of insect life. The large group which embraces the grasshoppers, the katydids, crickets, mantises, cockroaches and the earwigs, those strange little insects that carry a pair of forceps as a caudal adornment, are but very little understood. In the jungles this group grows to enormous proportions and shows unusual traits and live according to their own laws that appear entirely different than the supposed laws of their tiny relations in the temperate zones.

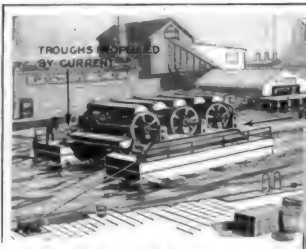
Insects form one of the largest groups of the animal kingdom. There are more than 250,000 species that have been known and classified and no one knows how many that have not been classified. In general, members of the insect family have three pairs of legs and two pairs of wings with three body divisions—head, thorax and abdomen. The body is often covered by a stiff sheath called the chitin and on the head are one pair of antennae or feelers, and one pair of compound eyes. There are numerous variations, however.



This large and amazing rare spinx walking stick was found in New Guinea. It is compared in size with a circle the exact size of a half dollar. The photograph is slightly reduced.

The insects can be of incalculable aid to mankind as they produce shellac, cochineal, silk, gallnuts, honey, beeswax, some acids and numerous other commercial products. A number of insects such as bees, moths, butterflies, etc., assist in fertilization of many flowers which without the aid of insects would never reproduce. There are, of course, numerous insects which are harmful. Some transport disease germs, some destroy crops, wood and clothing, while others inflict painful wounds.

New Water Power Generator Floats on Stream Surface



Bucket troughs are turned by water to generate electricity in this newly invented power plant.

FRANK L. GAEDE is credited by engineers with an invention that may revolutionize the water power industry. Power is generated by flowing rather than falling water. The mechanism is an endless chain of troughs or buckets propelled by the current of the stream and operating generators in sections of the floating power house.

Frank L. Gaede with a model of his generator.

Vibrator for Grid Players

SOME university football coaches are using electric vibrator devices to aid in conditioning their players. The vibrator machine aids in eliminating superfluous flesh.

Vibrator in use to condition a football player.

Glasses for Color-blind Eyes

SPECTACLES through which a color-blind person can distinguish colors like people with normal eyes, articles long begged for by these unfortunates but as often called impossible by scientists, are finally promised, at least for some varieties of color-blindness, by new glass materials perfected by Professor Franz Weidert of the Technical College in Berlin. The materials resemble ordinary glass but contain the rare chemical elements neodymium and praseodymium. In thin sheets or lenses like those used in spectacles, the new glasses seem almost perfectly transparent. Examination with a spectroscope discloses, however, that certain rays of the complete rainbow-colored strip into which white light is separated by that instrument are missing after the rays have passed through the new glass. The glasses absorb these rays, the particular ray which is absorbed differing for different chemical compositions of the new glass. The rays chiefly absorbed happen to be orange and yellow ones, the German physicist reports, standing in the spectrum between the red and the green which are two of the colors most troublesome to color-blind individuals. The new glasses remove these intermediate rays.

Novel Colored Postcards Made With Cancelled Stamps

FASHIONING artistic postcards with cancelled postage stamps is all in the day's work for an obscure Chinese artisan of Formosa. He sketches his scenes and then fills them in with parts of stamps, to make truly colorful pictures. Two of his best pieces of work show a lady riding in a rickshaw and a lady riding a caribou. Exceedingly intricate designs can be worked out with the stamps and the art introduced by the Chinese is destined to become quite a fad.

"The Queen of the Rickshaw," a colored postcard made from cancelled stamps is shown above and at the left a Formosan lady is pictured.

Pedestrian Traffic Signal Synchronized With Street Controls in Detroit

IN AN effort to protect and control pedestrian traffic Detroit has installed warning signs solely for the benefit of pedestrians, and which operate in conjunction with, but slightly ahead of, the regular traffic control lights. This device developed by William L. Potts, head of the police department signal division, is being tested out on a busy intersection. The signal is a round box with a glass face on which the warning appears in illuminated letters nine seconds before the traffic lights start north and south traffic moving, and eleven seconds before the lights change in favor of east and west traffic. These times have been carefully worked out from tests as to the average time required to walk across a thoroughfare of given width. When the pedestrian comes to the edge of the sidewalk he knows that he will have sufficient time to cross the street before traffic direction changes unless he finds himself facing a glowing warning: "Pedestrians Stop. Too late to Start." Eight of these warnings have been installed so that no matter in what direction a pedestrian is walking he will face one of the signs. The lights in the warning signs are extinguished when traffic control lights actually change.

This lighted sign gives pedestrians exact notice as to whether or not they have time to get across.

FREE Flying Courses

Are you going to ride in the second cockpit pictured above and have an instructor tell you how to work the controls and become a pilot?

Gene Shank, former world's loop-the-loop title holder, is shown on the left congratulating Fred Resico, Jr., winner of the first Modern Mechanics contest upon Resico's completion of his course.

THE fourth MODERN MECHANICS win-your-wings contest in which free flying courses are offered is opened in this issue of the magazine. Entries in the fourth contest must be postmarked not later than February 1. Three earlier contests have been closed and the winner of the first has completed his training and become a pilot. The winners of the subsequent contests will be announced as soon as the judges complete their selections.

There will be several more contests, one every month, but don't delay making your entry or you may be disappointed through the steadily increasing number of contestants. Never has there been so popular a contest of this kind. And all you must do is follow the simple rules printed on the next page.

Six questions dealing with aviation are scattered through the advertising section of this issue of MODERN MECHANICS. Find those questions. Answer them and follow

Are Waiting for You

Twelve more young men or women are to be made pilots with Modern Mechanics paying all their expenses. Entrance requirements of the contests which are being held every month are very simple and open to all. Here's your opportunity to win your wings without cost. Mail your entry today!

instructions on the next page. Mail your entry and you may be the lucky one to win a free flying course and your pilots' license.

The winner of first place in each monthly contest will have all expenses paid for a complete flying course. Railway transportation to and from the training field, living expenses while in training will be paid for by this magazine. The training won't cost the winner a single cent. The winner will be given a helmet and goggles and all other necessary equipment will be loaned by the flying school.

The training courses will be available at any one of the following schools, the one nearest the winner's home being selected: Shank Flying School, Minneapolis, Minn.; the Von Hoffmann Aircraft Co., St. Louis, Mo.; the Aviation Engineering School, New York; and the Western College of Aviation, Los Angeles, Calif.

Winners of the MODERN MECHANICS aviation contests will in each case be given instruction by licensed transport pilots, using dual control ships of modern type which are inspected by government officials for airworthiness.

The winners of second and third places in each monthly contest will also be given prizes which will be sent as soon as the judges complete their selections. The second prize is a leather air-mail helmet. The third prize is a pair of non-shatterable aviator's goggles.

Enter the contest this month and if you don't win this time you are not barred from trying again in the later contests. That gives everyone several chances to win a free flying course. The sooner you enter the more chances you will have. Don't pass up this wonderful opportunity.

Rules of the Contest

Scattered through the advertising pages of this issue of Modern Mechanics you will find six questions dealing with aviation. For the best letters containing answers to these questions, as determined by the contest judges, prizes will be awarded as announced elsewhere on this page. Neatness, originality, and adequacy of answers will be guiding factors which will help the judges determine the winners.

Anyone may compete who is 16 years of age or over, and a resident of the United States. Members of the staff of this magazine are, of course, not eligible to enter. Address your letter to Flying Contest No. 4, Modern Mechanics magazine, 501 Seventh Ave. South, Minneapolis, Minn. Entries must be postmarked not later than February 1, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, find and answer the six questions, and send in your entry now. Don't forget to include your photo!

ENTRY BLANK

My name is .....

Address .....

Age ..... Height .....

Weight ..... Sex .....

If under 21, please answer the question below:

Will your parents consent to your learning to fly?

.....

Parent's signature .....

Attach your answers to the six questions, and your photo, to this blank. Mail before February 1, 1930, to

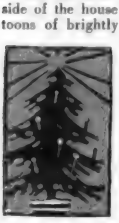
Flying Contest No. 4
Modern Mechanics Magazine
501 Seventh Ave. So. Minneapolis, Minn.

Hints on Installing the

This attractively decorated home was a prize winner in a Minneapolis contest for the best-lighted Christmas home. Any householder can produce these attractive lighting effects with little trouble.

IN THE old days Christmas tree decorations were largely confined to the inside of the house, where Dad set up a spruce tree in the parlor and mother decorated the tree with spangles and stars and ropes of popcorn strung by the children.

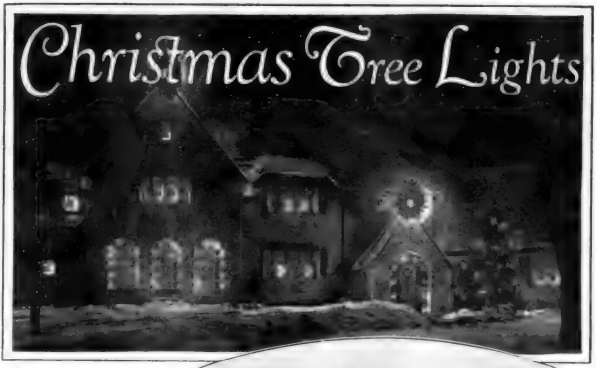
But of late there has been a tendency among householders of northern cities to share their Yuletide joy with the world at large by setting up elaborately decorated trees in the front yards and giving the outside of the house a festive aspect with festoons of brightly colored lights. There is no denying that this practice adds to the holiday spirit and helps build up a feeling of civic solidarity among the townsfolk.



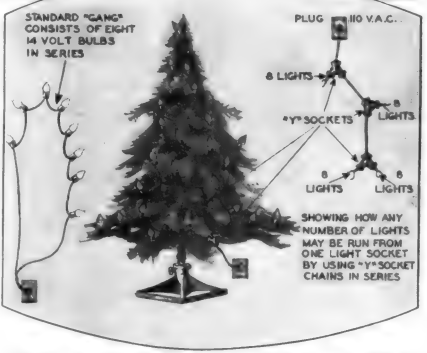
There is nothing complicated about the installation of attractive lighting effects. If a few simple rules are observed, the outdoor decorations become simply a matter of artistic judgment rather than a mechanical problem. The most common units used in arranging the lights are strings of eight 14-volt lamps coupled in series. The total voltage of such a string thus runs to 112 volts. Bulbs are usually vari-colored in red, green, orange and blue, with sometimes fancifully shaped globes representing the figure of Kris Kringle.

The number of lights used is important from an electrical standpoint. Any multiple of eight lights can be used off one socket providing a strong enough fuse is used to "back up" the circuit. With ordinary fuses the practical limit of multiplication is 32 lights, or four gangs. More lights can be used if the regular fuses are replaced with stronger ones. The multiplying of light gangs is accomplished by the use of Y sockets, as shown in the diagram. It is, of course, only prudent to have a number of reserve bulbs on hand to replace those which burn out, since when one bulb of a number connected in series burns out, the circuit is broken and the other bulbs go dark also.

Christmas Tree Lights



Note how the house is made part of the decorations in this picture, which won first prize last season in a contest in Minneapolis. White, green, red and blue lights were used.



This diagram makes it clear how a number of strings of lights can be lighted from one plug, using Y sockets. Four gangs can be run from one socket without changing the fuses.

The photographs shown on these pages of two prize-winning home decorations give some idea of the attractiveness of well-placed lights. The style of the house of course determines the nature of the decorations to a large extent, since the building itself is an essential part of the effect. A favorite method is to place one or more fir trees in the yard as a frame, running strings of lights around the windows, above the porch or gables to complete the picture.

Local newspapers can arouse a surprising degree of interest by offering prizes for the most artistic effects. The towns in which such contests are held inevitably take on a cheerier, brighter aspect. Anyone who has visited various northern cities during the Christmas holidays will recall with pleasure the hospitable warmth of red, green, and blue lights reflected in the white snow. Lights in the shape of crosses or brilliant stars make fitting pieces for placing atop the roof peaks of the house. Holly wreaths with electric candles burning in their centers make excellent window ornaments. Never use the old style wax candle, either in the holly wreath or on the Christmas tree, because of the danger of fire.

PROBING the SECRETS of

Use of hypnotism as an anesthetic is illustrated in the above photograph which was posed. A serious operation was performed in a Chicago hospital with the patient under hypnotic influence.

CENTURIES old, yet still veiled in the semi-blackness of ignorance, hypnotism again looms over the horizon as an important science in the lives of men. Medical men are again turning to it as a substitute for anesthetics; super criminals have employed it in perpetrating daring robberies; the police have successfully used the mystic sleep in securing important confessions; science has found in it a remedy for mental and nervous diseases hitherto deemed incurable. The future holds even greater possibilities for the wise usage of hypnotism and the hypnoid sleep.

One of the greatest wonders of hypnotism is its use as a substitute for anesthetics, particularly in cases where the patient's heart might be affected by the drugs, or where there would be possibility of severe after effects.

Witness the recent hypnotic operation performed in St. Luke's Hospital, Chicago. The patient, a woman; the operation, a serious case of abdominal adhesions—successfully carried out in the course of one hour as the patient lay hypnotised on the operating table. Over and above experiencing no pain, the patient was not subject to the usual nausea which commonly follows the administration of chloroform or ether.

The St. Luke case is not a lone medical credit to hypnotism; similar operations have been performed times innumerable.

"Medics" have not been alone, unfortunately, in the development of this strange science. Even as crime borrowed machine guns and tear bombs from the war; a quick method of transporting illicit cargoes from aviation; so also have they borrowed from the vast accumulation of lately-acquired psychological knowledge their newest tool—a working knowledge of hypnotism.

A recent case from Los Angeles illustrates. The criminal, in this case, placed his victim in a hypnotic trance, and then, casually and with the calm assurance that he

HYPNOTISM

An article which reveals uses of mystic powers

Hypnotism by radio is a new departure. The mystic at the right is speaking sleep compelling words into the microphone to affect the subject in the picture at the left.

A subject in a hypnotic trance apparently does not feel the jab of a sterile needle point.

had all the time in the world, systematically rifled her apartment. So clever was he that the woman, on awaking three days later, could not remember the man or what he looked like!

She did remember, however, a little effect which the crook performed, half convincing her that the man really could waft her gently to Slumberland if he so desired. (The hypnotist banks on that for his first step towards inducing the hypnotic state, convincing the subject that he is about to be hypnotised.)

The device he used was quite simple—merely a three-inch circle drawn on a sheet of white cardboard, with two lines crossing at right angles through the center. One line is labeled AB; the other, CD. By holding a small weight suspended from a string over the center of the arrangement, and thinking of the line AB, the weight will slowly begin to swing along the line AB. Changing the concentration to CD, the bob will change and swing in the opposite direction. Thinking of the circle will cause the bob to swing in a circle. All this occurs without any consciousness of an effort to make the pendulum swing. The motion of the hand, too slight to be perceptible, is caused by thought.

Science knows it as "Chrevruel's pendulum." The same outfit is also sold under various guises—as a "sex-indicator," a "mystic charm," etc.

The purpose which it served the crook was to enable him to convince his victim of the possibility of strange mental states, and at the same time to establish his authority. After thus subtly moulding the mind of his victim into a receptive state for the hypnotic sleep, the rest was simple—another crime, unsolved, unpunished.

But—it is a double-edged sword—this hypnotism! Dr. Langsner, marvelous hypnotist of Vienna, does and says things to worry the criminal. By hypnotism he caused a young criminal to confess after fifteen

Chrevruel's Pendulum Experiment Is a Simple and Interesting Study

Above a girl is shown thinking of the line AB and as a result the pendulum swings from A to B. The Chrevruel pendulum chart is shown in the inset, simply a three-inch circle with lines drawn from A to B and C to D.

minutes the murder of his mother, sister and two hired men.

Dr. Langsner says everybody has a sixth sense that can be made to receive the thoughts of another. Thought is something like a broadcasting operation. He hypnotised the criminal and easily obtained the truth from him because "his crime is always on his mind."

The learned doctor is not alone in this usage of hypnotism. Various crimes, locked tight in the hearts of men under the grilling of the customary "third degree," have welled out coherently and intelligibly while the criminal was under the control of hypnotism. Of course, the matter of tricking a man into hypnotism is much more difficult than hypnotising a person who has freely surrendered his will to the hypnotist. Nevertheless, the field of hypnotism offers many new and startling angles to the criminologist; and if once developed to the state of even partial efficiency, it would do wonders in speeding justice and eliminating the brutal, behind locked doors, "third degree" now in vogue.

The power of suggestion which the hypnotist holds over the subject is so great as to be often ludicrous. A trick which has been used with considerable success by a man who is in no sense a hypnotist, consists in placing the man-about-to-be-hypnotised in a chair, with his arms folded and his feet slightly in advance of his body. The subject is half-convinced that he is about to be "put to sleep." Really, however, the pseudo-hypnotist does nothing but go through an impressive ritual of passes and stares. The effect is surprising. On being told that he cannot rise from the chair, the subject will invariably find, that really, he cannot rise! The explanation of the trick is simple—with the arms folded and the feet placed as shown it is rather difficult to arise; suggestion does the rest!

Post-suggestion is even stranger. By the use of post-suggestion, the robber who uses hypnotism may cause his victim to forget

the robbery, the doctor may cause his patient to be cheerful and happy during convalescence, etc.

Hypnotism by radio is comparatively new, inasmuch as radio itself is but in its infancy.

The procedure is much the same. The patient freely consents to the use of hypnotism. She is made as comfortable as possible, in close proximity to the loudspeaker over which will come the command, "sleep."

All set! An attendant darkens the room slightly, and while the patient fixes her eyes on the soft luminous glow from a partly-concealed light, the hypnotist's voice comes soothingly and monotonously over 200 miles of ether—"sleep, sleep, sleep . . . think of a gently-drifting boat . . . think of gently drifting off to sleep."

Not once does the subject remove her eyes from the light. Five minutes—ten minutes pass. Slowly and almost imperceptibly the subject's eyes lose the luster of earthly thoughts, she seems to be dreaming.

"Now, sleep!"

An attendant draws eyelids over staring eyes. Another attendant stabs the bright sterile point of a needle into the patient's arm. Not a quiver or response; all sensation has apparently vanished.

Placed as shown and thinking she is hypnotised the subject can't rise although she isn't in a hypnotic state.

Comes again the voice over the air, now rasping in its sibilant bark.

"Now, awake." And there you are!

Criminals fear hypnotism for in a trance they may reveal details of their unknown activities.

Behind the SCENES

Scientists experimenting in the field of television predict the perfection of practical home sets within a short time. This article explains the present status of television and tells of various methods of visual reproduction used in present Radio sets.

This compact German television receiver is notable for its simplicity. Note the comparatively large size of the screen and the simplicity of the set.

WILL tomorrow's home entertainment be furnished by a television set which, at the turn of a button, presents on a screen a visual and audible reproduction of a scene being enacted on a stage hundreds of miles away? If predictions of experimenters now working on television apparatus are to be believed, this is exactly what will be possible within a few years.

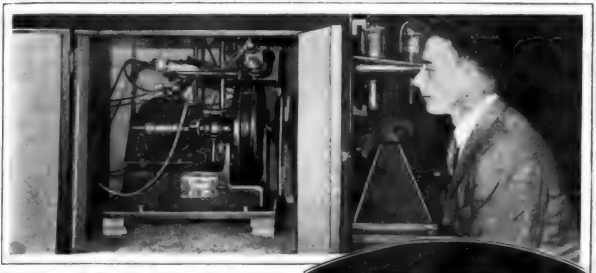
Already there are several commercial television sets on the market, and there are a number of stations broadcasting for such sets. But as yet television has not been perfected to a degree where it is practical for the average man; it is in a stage of development roughly comparable to that of radio when dot and dash symbols were all that could be sent over the wire.

At present there are several difficulties to be overcome before television can be considered practical. The neon lamp used in present sets produces a comparatively weak light. A strong source of light which can be actuated with the swiftness of the neon lamp is needed. Another necessity is for a dependable, foolproof method of synchronization. In the motor driven scanning disk method now used it is essential that the motor at the broadcasting station and the motor in the receiving set be turning at exactly the same speed. If they are not, an inevitable distortion in the image ensues.

Behind the scenes in the television broadcasting station. The young lady is being televised while the man with the revolver produces the sound effects. Black makeup is used by the actors; red makeup would be neutralized by the red neon light and a toneless image would result.

Various methods of approach to the problem of the perfect television set are open

with TELEVISION

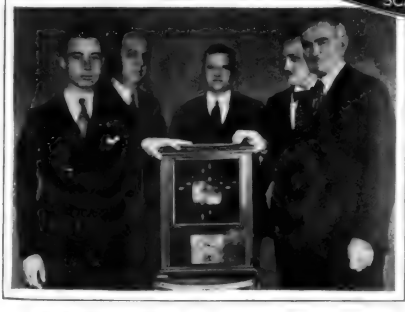


Mechanism of the three lamp Baird receiving set is clearly shown in the photograph above.

to scientists. One is to make use of no moving parts whatever, in which wireless impulses are received and converted into X-ray beams and thence into visual images. Another method is to use a vibrating mirror in place of the disk which now correlates and concentrates the radio impulses. The system in most general use today makes use of the concentrated neon ray, parabolic reflectors and lenses.

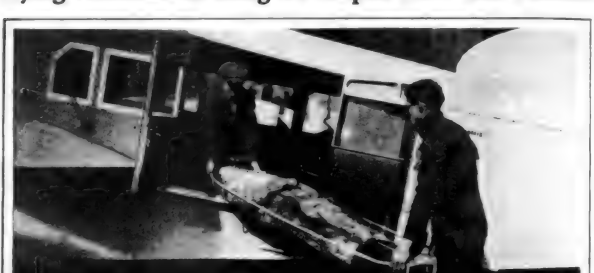
C. Francis Jenkins, well known for his work with television, makes use of a quartz drum instead of the conventional perforated scanning disk in his latest sets. The quartz not only makes possible the use of a much smaller disk, but employs the principle of retention of vision to make the images smoother. The quartz drum takes less power to operate.

These photographs show comparative sizes of the Jenkins quartz drum and the usual scanning disk. The drum takes less power to operate and is more easily synchronized.

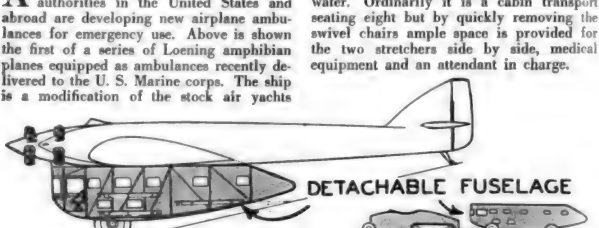


Radio pioneers beside present-day television receiver.

Flying Ambulances Being Developed Here and Abroad

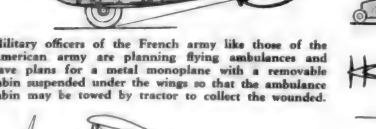


AIRPLANE manufacturers and military authorities in the United States and abroad are developing new airplane ambulances for emergency use. Above is shown the first of a series of Loening amphibian planes equipped as ambulances recently delivered to the U. S. Marine corps. The ship is a modification of the stock air yachts and is capable of alighting on land or water. Ordinarily it is a cabin transport seating eight but by quickly removing the swivel chairs ample space is provided for the two stretchers side by side, medical equipment and an attendant in charge.



Military officers of the French army like those of the American army are planning flying ambulances and have plans for a metal monoplane with a removable cabin suspended under the wings so that the ambulance cabin may be towed by tractor to collect the wounded.

Above are sketches showing the newly planned French ambulance airplane with the cabin removed and being towed by a tractor to be filled and returned to the ship and flown away. The removable cabin is to be equipped to care for 12 wounded seated or six wounded men on couches. The detachable cabin will give the ambulance ship a greater field of usefulness as it would eliminate the necessity for individual transfer of wounded from regular ambulances to the airplane.



The Nieuport-Delage is another type of French ambulance plane contemplated by the military, a long door in the body permitting the placing of wounded men on stretchers within the body of the ship and out of the way of the ship's pilot.

Trained Carrier Pigeons Are Reliable War Messengers

Pigeons, wrapped in cloth to protect feathers, are being placed in pockets of a member of a bicycle squad.

Message is folded and enclosed in a special case that is attached to the pigeon's leg. A special photographic-microscope process is employed in the preparation of these messages.

One hundred carrier pigeons can be carried in this motorcycle transport to a distance of 15 to 35 miles from home. Released they speed back.

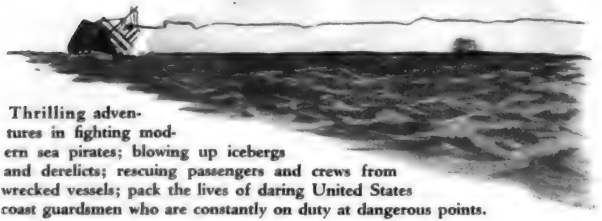
MEMBERS of the signal patrol of the German army enjoy their work in training carrier pigeons. Careful training coupled with the natural instinct of these birds makes them reliable message carriers. In training they are set free at gradually increasing distances from home. Immediately upon release from their cages they will zoom into the air, instantly aware of the home direction and wing for home at the rate of 35 miles an hour. During the war pigeons were found to be invaluable for the transmission of messages from spies within enemy territory. Unauthorized possession of carrier pigeons in war time is a death warrant.

This German Motor Truck Engine Is Fueled With Brown Coal Briquets

The first picture of the coal burning automobile truck.

ANNOUNCEMENTS have been made in Bonn, Germany, of the invention of a revolutionary motor truck which is propelled by an engine which is fed by brown coal briquets. No gasoline or benzol or other liquid fuel is required by this sensational motor. It is calculated by the inventors that their discovery effects a saving of 90 per cent in operation costs. The fuel box for the truck is slung at one side of the driver's cab. If the matter of bulk of fuel can be solved it is anticipated that this coal burner truck will become popular for certain types of motor transport work.

Uncle Sam's Pirate



Thrilling adventures in fighting modern sea pirates; blowing up icebergs and derelicts; rescuing passengers and crews from wrecked vessels; pack the lives of daring United States coast guardsmen who are constantly on duty at dangerous points.

By JAMES NEVIN MILLER

"STICK 'em up!"

Eight men, members of a Coast Guard patrol boat crew, were forced to obey this terse order on an afternoon not so long ago. Their situation was desperate. Armed with a pistol, and brandishing it menacingly, a scoundrel of the vicious type common among the smuggling fraternity that plies its illicit trade off the coast of Florida, was in command of circumstances that seemed to spell sure death for the losers.

A pretty smooth article was this particular smuggler. Brains of a low, cunning sort he had—plenty of them, as he had demonstrated just a few moments earlier. Then the situation had been considerably different. While making regular rounds along a notorious coastal region, the boatswain of the government vessel had sighted a speed boat whizzing along at a terrific clip. According to usual custom he had fired a warning shot into the air to signal her to heave to for examination.

The shot produced the desired result—and when the patrol boat pulled alongside the speedster, the boatswain found two suspicious looking characters surrounded on every side by contraband cargo. Giving the names of Alderman and Weech, the smugglers submitted quietly enough to search, though Alderman, evidently the leader, had a dangerous look in his eyes.

Having apparently relieved the outlaws of their arms, and placed them under arrest, the boatswain, pistol in hand, turned his back only long enough to pick up a radio telephone so as to apprise his shore section base of the seizure, when suddenly a shot rang out and he fell to the floor, shot in the back by Alderman, who in some clever fashion had contrived to conceal an automatic about his person.

Now the boatswain was remote from the rest of his crew, who were occupied in transferring the contraband from the seized vessel to their own craft. So there was no one near to aid him. His motor machinist's mate, however, happened to be on deck, and not a whit frightened by the armed smuggler, he made a dash for the cabin, where he knew he might get a pistol. But he was a fraction of a second too slow—another shot rang out and the mate fell headlong into the engine room, seriously wounded.

Here was a situation for the writers of melodrama to wax enthusiastic about. Grabbing the boatswain's pistol as he lay prostrate on the floor, Alderman was able to attract the attention of his confederate quickly enough so that the two outlaws, both armed, were in a position to dictate orders to the entire crew. Far worse than that, they now threatened to kill everyone and destroy all evidence of their crime by setting fire to the patrol vessel.

When the crew had been forced in a body

PATROL

Fights every sort of danger from rum runners to derelict ships menacing navigation.

Thousands of persons owe their lives to coast guard crews such as the one pictured above heading for a wrecked steamer.

to the stern of the speedboat, Alderman, brandishing the automatic, ordered Weech to tear out the gasoline lines in the patrol boat's engine room and attach a match thereto. Knowing very little about the boat's construction, Weech, experiencing considerable trouble in carrying out this order, asked the wounded machinist's mate to help him. But the latter, despite the threat of death, refused.

Somehow or other, however, Weech managed to tear out the gas lines and touch a lighted match to them. But he was in such a hurry to return to the speed boat to aid his confederate that he apparantly failed to notice that he had not ignited the gas.

Now, while Alderman held the crew at bay, Weech tried to start the speed boat's engine for a quick getaway. Fortunately it missed fire and when Alderman glanced down to inquire of the trouble the patrol crew instantly and fearlessly rushed him. A fierce struggle ensued, Alderman firing several times with the result that one man was killed and another badly wounded.

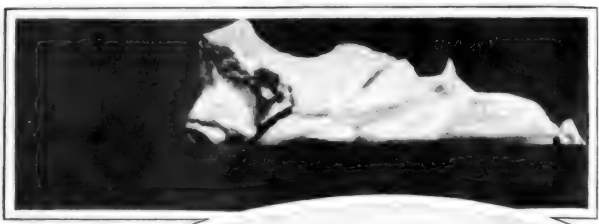
The upshot of this dramatic story was the hanging of Alderman and the imprisonment of Weech. Drama almost equally as thrilling may occur at any moment during the activities of the official guardians of our coasts. In the course of their everyday

Beach patrolman burning special signal to warn a vessel coming too close to dangerous reefs.

affairs they may be called upon to fight pitched battles with rum runners; climb giant icebergs; battle with raging seas in an endeavor to save the lives of shipwrecked persons; or make perilous plunges into icy waters to rescue the drowning.

Consider the work of the far-famed ice-

Patrol Must Warn Ships and Put T.N.T. Mines in Dangerous Icebergs



The Coast Guard Cutter on International ice patrol duty in the North Atlantic ocean. One of the important duties of the guard is to locate the ever drifting icebergs which are carried by wind and current into ship traffic lanes endangering ocean liners and freighters particularly at night and during foggy weather. When imperative the guardsmen use T.N.T. to blow up icebergs and drifting icefields to protect shipping. This is but one of the perilous duties of the corps which is constantly on duty.

Above is a photograph of an actual rescue by coast guardsmen. The guards are landing with refugees from a vessel which was wrecked and pounding itself to pieces on reefs far off shore.

patrol which operates during the months of April, May and June of each year in the vicinity of the Grand Banks, off Newfoundland. Everybody knows that the presence of ice is a constant menace to the vessels passing through the northerly ice area. But not so many people realize that icebergs sometimes go as far south as the Gulf Stream and have been known to last, in those warm waters, as long as seven days. If the ice was stationary there would be little danger but the winds and currents move the icebergs causing a constant hazard. It is the duty of America's patrol cutters to eliminate this danger by giving each vessel, of whatever nation, passing through the ice areas, all possible information regarding the currents, the set and drift of the ice, and its location at all times.

To obtain this data requires considerable cruising and searching for bergs in the most treacherous regions. Lieut. Commander Edward H. Smith of the Coast Guard, internationally known as an iceberg authority, reporting on a recent trip, said: "From 200 to 300 great bergs were normally in sight at all times. They would occasionally roar like thunder as they split and disintegrated in the warm mellow sun."

Commander Smith remarks ironically that "there was really no danger from the icebergs so long as it did not get foggy. Should they ever become thick they could always be avoided by ships to the same degree as an auto avoids skyscrapers in Manhattan."

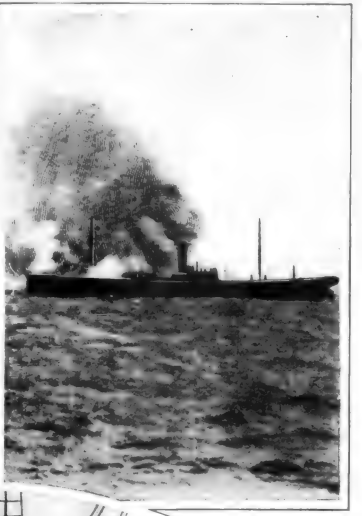
During the past year the vessels and stations of the Coast Guard have destroyed 167 derelicts. A derelict, as its name implies, is a vessel that for some reason or other has

been left by its owners to drift the seas, a constant menace to navigation.

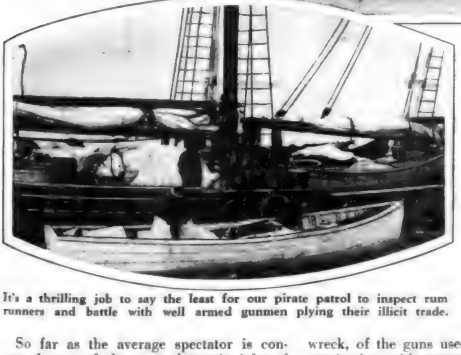
About the only thing left to do—and this tough job falls to the lot of the coast guardsmen—is to try to destroy this navigation menace. Time and time again they have fired into crazy old hulks a goodly number of three-inch shells. Another method is to employ T.N.T. mines. Since they must be placed at strategic places in the derelict, the task is dangerous to say the very least.

At all Coast Guard stations a fixed beat or patrol is laid out in each direction along the shore. The station crew is divided into regular watches of two men each, and during the hours from sunset to sunrise the men patrol their beats, keeping a sharp lookout seaward at all times.

Each patrolman carries a number of red signal torches which he employs to warn vessels that come dangerously near shore, or to notify a vessel in distress that he is about to summon assistance.



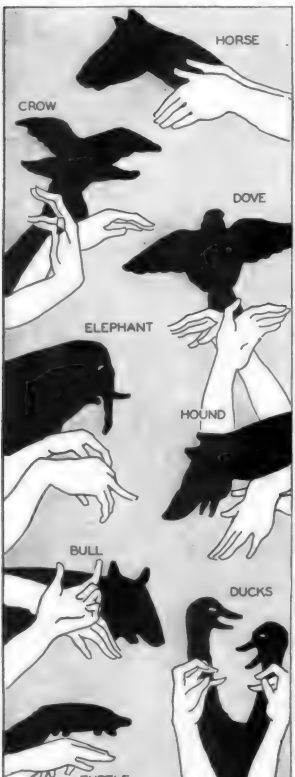
This burning vessel has been abandoned, and burned down to the water line would be a menace to navigation. One of the important duties of the coast guard is to locate these derelict ships that have burned or drifted from their moorings to sail the seas. Once located, the guardsmen destroy them with T. N. T., mines or gunfire.



It's a thrilling job to say the least for our pirate patrol to inspect rum runners and battle with well armed gunmen plying their illicit trade.

So far as the average spectator is concerned, two of the most dramatic jobs of the Coast Guard are concerned with the remarkable workmanship, in times of shipwreck, of the guns used to effect line communication with stranded vessels, and the life-cars which run on cables shot out to stranded vessels by the gun.

FUN with SHADOWS



Position of the hands to cast the various shadows is clearly shown above.

Profiles of birds and beasts can be made with hands, a light and a screen. This feature explains how anyone can cast the shadows of sixteen different figures, an accomplishment which will provide many full evenings of entertainment for either children or adults.

By DALE R. VAN HORN

NO DOUBT all of you know a few ways to cast bird or animal resembling shadows upon the wall. One who has a dozen or more ways to hold his hands for this purpose will easily afford an interesting hour of evening's fun. And if he chooses to show his ability at a party, he will be as much in demand at others as a good amateur magician.

The accompanying illustrations show 16 animals, birds and reptiles which can be easily shown with shadows. In practically every case, the position of the hands and fingers show well enough so that their exact location need not be described. In some instances you will be able to show an eye somewhere near where the eye belongs; in others, this will have to be left to the imagination.

One of the easiest shadows to do is that of a horse. It is also one of the best imitations. Place the hands together, first taking care that the thumbs are properly spaced and most of them showing. Then move the touching fingers slightly until you have a good muzzle and jaw also upon the screen.

The elephant is also good because you can cause the trunk to move back and forth in a realistic manner, at the same time moving the left thumb, which throws the shadow of the lower jaw. The puppy can be made to wiggle his tail and also appear to run by moving the fingers which throw shadows for the feet. This shadow is not complete in itself as the arms continue to cast a shadow behind. However, the arrangement soon to be described will help to give the perfect impression.

The cat needs both forearms as well as the hands and one must focus his attention on the left-hand side for best results. The

for Home Entertainers

Ordinary sheet provides the screen for shadow entertainment. Strong electric bulb can be provided with home-made reflector and a cardboard shield — all the equipment needed for highly entertaining home program based on complete details in this article.

shield described later will help to minimize this defect however.

All you have to do to give the spider shadow is to lock the thumbs together and spread the fingers. Wiggling them will heighten the effect. The turtle is somewhat like the puppy but it is minus tail and to omit this the left thumb is turned down. The crow can be made to fly seemingly by slowly moving the fingers of both hands up and down in unison. The hound can be made to close its mouth for a moment then, quite naturally, open it again and pant.

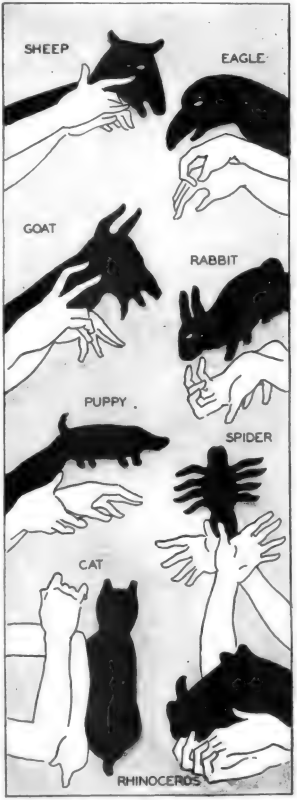
These are only a few of the shadows possible and with some practice you will be able to evolve other combinations of fingers to produce other results.

The fingers should be exercised frequently to facilitate imitating various kinds of shadows. Begin by spreading and closing the hands, then moving one finger away from the other and back again; then two away and back, then three away and back.

The light should have a shield to throw a circle of light upon the screen. Then any portion of shadow not wanted, such as the right hand side of the cat or the south end of the puppy (going north) can be merged with the shadow cast by the shield.

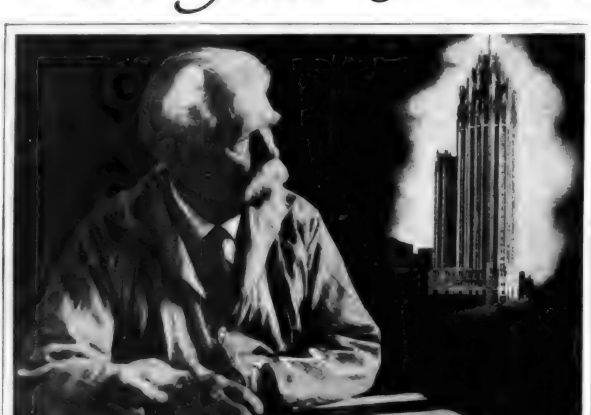
A good apparatus is to fix a 100-watt bulb in a socket on top of a portable stand with flexible cord and switch in connection. Over this light set a tin can with the bottom fitting snugly to exclude light. A hole one inch in diameter is then made in the side of the can and through this issues the light to be used.

Now cut from a large sheet of stiff cardboard, a hole 10 inches in diameter and provide this also with a support so that it can be set in front of the light and on the same level. The hands are then manipulated between the light and the shield. A sheet hung on the wall serves as a screen.



The spider shadow is an easy one to make and "comes alive" when the fingers wiggle.

Does Your FUTURE



Leroy S. Buffington, Minneapolis architect, was scoffed at when 49 years ago he dreamed and designed the first skyscraper and patented his invention introducing the scheme of a braced steel skeleton to support many stories of a structure, thus making the world's skyscrapers possible.

By F. M. MANN

Professor of Architecture, University of Minnesota

Fifth of a series to help you in choosing a vocation.

AN ARCHITECT is a person who designs buildings to meet special requirements. He strives to meet the needs so perfectly that his buildings may become beautiful. His designs are not merely pictures on paper, but an image in his mind of the building actually translated into material form. To build this image in his mind he must think through every part of it and ultimately show his conception by drawings in order that his client and the builder may see and understand it. Design therefore, involves many things including planning and construction, selection of materials, equipment and the working out of every part in detail. The architect's work also includes the supervision and much of the business and organization of the process of producing the actual building from his design.

After the architect receives a commission to produce a building he first studies the uses which it is to serve. He determines with his client the economic limit of cost which the purpose requires and warrants. He often helps select a proper site and then studies its physical character, its contour, its surroundings, its exposure to the cardinal points of the compass, finds out what its available heating, lighting, power and other services are. He also informs himself

Lie in Architecture?

Advantage of architecture as a profession is primarily that it is creative work and permits exercise of imagination and requires a broad and accurate knowledge of many things in designing buildings to meet requirements.

fully as to the requirements of the proposed uses of the building and to the means by which all such requirements may be met. He then proceeds to work out various possible plans and in conference with his client finally develops a plan that seems to his client and to himself to meet all requirements in the most perfect way possible. After the plan is developed he selects the materials to be used and works out the general exterior appearance best suited to the purpose of the building. From the beginning he must consider how the various parts can be constructed most simply, and economically. Thus far the work is

An unusual picture of a new steel skyscraper under construction across from the Woolworth tower on the site of the old New York postoffice. The Woolworth tower is so high that from across the street and looking up it is impossible to see the tower on top of the famous building.

Cass Gilbert, who designed many state capitols and other noted buildings throughout the world.

in what can be called the preliminary stage. When the form of the building and its parts becomes definite he must begin to calculate each part for strength and economy and, in order to make the building fit its requirements practically, he must perfect all forms and proportions. If it perfectly fits its purpose his design begins to give a degree of satisfaction beyond the utilitarian and takes on elements of beauty. Thus far the architect has perfected his conception or "design" and perhaps determined the exact size and strength of all structural members.

Architects designed and planned every small detail of these New York cloudscrapers, photographed from an airplane.

In order to translate this design into material form many drawings are required and the office draftsmen are called upon to lay out the various parts to exact scale. Even on relatively simple buildings many sheets of drawings are necessary and on large buildings the number of drawings often runs into hundreds.

Meanwhile the mechanical requirements are studied and developed. These include heating, ventilation, plumbing and electrical equipment, all of which must not only be calculated, but must be completely shown on drawings.

When the drawings reach a stage of substantial completion the specifications are begun. The specifications exactly describe the materials and methods that are to be used and followed in the construction of the building. When drawings and specifications have been completed and approved by the owner, bids are invited from building contractors and are received usually at the architect's office. These bids are then studied and analyzed and a report prepared for the owner, who, in consultation with the architect, determines which bid is most advantageous. The architect then prepares agreement documents, and the contractor selected and the owner sign these and the actual building operation is ready to begin.

During the construction work the architect supervises the work at the building both to see that the plans and specifications are being followed in detail and to explain and interpret their intention to the builder.

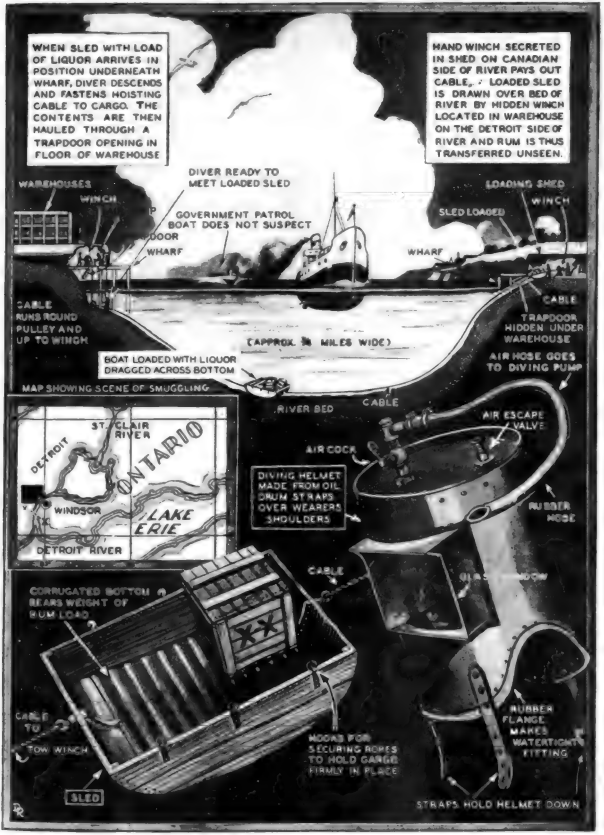
I have stated the above to indicate the complexity and responsibility involved in the architect's work.

The advantage of architecture as a profession is primarily that it is creative work and permits the exercise of imagination, acknowledged to be one of the finest of human faculties, and requires a broad and accurate knowledge of many things. The architect's work also includes the business of organizing and directing the complicated operations of building.

If the young man entering the profession of architecture has the aim to arrive at a high place in the profession where he will win fame, the responsibilities and the corresponding emoluments of a large practice, he must expect advancement toward his goal to be slow. The same may be said of high places in any other profession or business. As to earnings, a man is paid in proportion to the service he renders.

The importance of architecture in human activities is obviously great. Shelter is a primary necessity and beyond common necessity happiness and efficiency are dependent upon pleasant environment and are increased by the element of beauty. The architect has to do with all of these. His ideal is to create beauty as well as to satisfy the requirements of utility.

Rum Runners Drag Cargo Under River



Federal agents at Detroit, suspecting the existence of a liquor "leak," discovered a diver's equipment hanging on the wall of a suspected warehouse and upon investigation found the ingenious smuggling system pictured above.

Cable Between Trees Makes Track for "Aerial" Railway

Here's the "depot" for the home-made elevated.

AN OLD chair, ingeniously attached to an overhead cable strung tightly between two trees affords holiday pleasure for a group of youngsters in the Bronx, New York City, for the combination comprises an aerial railway. The chair is supported by ropes attached to each of the four corners of the seat, the ropes being fastened to two dross bars in which pulleys have been bolted. There is a platform and ladder at the base of one tree and ropes attached to the elevated car pull it between the trees. If the cable were slanted between the trees the elevated would be self-acting on the "out" trip.

New Wood for Tree Doctoring

AN ALL wood product has been developed for filling cavities in trees. It is a plastic filling mixed and placed in the tree, solid with plenty of elasticity, allowing the tree to sway in the breezes without damage to the filling. The filler is made in two colors, brown and gray, so as to blend in with the color of the bark, making it hardly noticeable. The filler adheres staunchly to the sidewall of the cavity and its antiseptic properties are reported to be extraordinary.

California Waging War on Ants

PARIS green, time-honored foe of potato beetles and other insect pests, promises victory in the war which California is waging against termites, sometimes called "white ants", destroyers of millions of dollars of wood-built structures annually. The effectiveness of the Paris green dust depends first on the cleanliness of the termites. They are forever licking themselves clean, and thus swallow the deadly powder. After they have died or are very notably weakened, a second termite habit comes into play. The insects are cannibals through thrift; they eat up their deceased relatives. It does not matter if the dead termite met its end through poison; it gets eaten anyway. Thus the same dose of Paris green may do away with several termites in succession.

Just a Sliver of Real Estate

HERE is pictured a mere sliver of real estate that bears a two story frame building at the corner of Melrose avenue and 161st street in the borough of Bronx, New York. A dog and cat hospital is located on the plot which is one of the smallest business sites in the world. The two-story building is so narrow there is room for only one window in front for each floor. The corner location and the unusual size of the hospital is reported to have attracted a business which keeps the small establishment busy.

Photo above shows hospital located on tiny site.

Mercy Bullets to Drug Wild Animals and Aid in Capture

MERCY bullets which carry hypodermic needles and anesthetic will be used to permit the painless capture of wild animals when Captain Barnett W. Harris, accredited representative of the Chicago Zoological Society and the Field Museum, heads an expedition into the wilds of Borneo, Sumatra, India, Africa and other countries collecting specimens for the new Riverside, Illinois, zoo. These dope bullets will eliminate unnecessary slaughter and cruelty which attends trapping and capturing of wild animals. When the bullet strikes, the needle penetrates the flesh, releasing the hypodermic shot of anesthetic into the system and rendering the animal unconscious in a brief time. Various compounds have to be used for different animals. Trials have shown that this method of bagging game for zoos is much more efficient than old methods which often resulted in disabling animals and in many instances disabling animals which escaped to suffer and later die.

Captain Harris shown above placing a mercy bullet with hypodermic needle in one of the guns he will take on expedition in wilds of Borneo.

Sail Devised for Swimmers

JOSEPHINE WHITE uses herself for a yacht. Her canvas mounted on a pole with a cross strut at its base supplies the motive power as she holds the spar between her knees. The strut prevents it from falling. The mainsheet is attached to one toe.

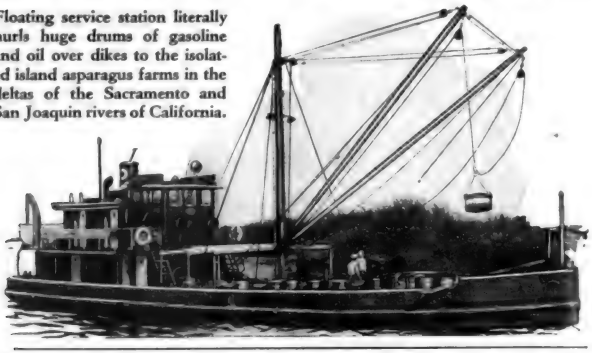
This girl holds the sail between her knees with mainsheet tied to one big toe and lets the wind and water do the rest.

Mechanical Light Symphonies

COLORED light can be made to sway, blend and sweep over displays, theaters, or buildings by a new control mechanism just perfected, according to J. L. Stair, Chicago electrical engineer. Like a piano player, the color combinations are controlled automatically by a perforated paper roll fed into the machine. "The dimming of the circuits is accomplished without flicker, and changes in color may be made exactly in a predetermined order," Mr. Stair said. "The fact that the control is based upon electro-pneumatics gives the opportunity for exact, quiet control, practically as subtle as that to be found in the pipe organ. As a perforated paper roll passes the openings in a tracker bar, the functions of turning on and off circuits and the operation of the dimmers are automatically performed. The nature of the color combinations may be predetermined and transcribed to the paper roll. The machine has great flexibility inasmuch as all circuits are in no way related. The operation of the dimmer is independent of the electrical circuits, enabling any combination to be preset. Further flexibility is obtained by various speed controls."

TANKER Tosses Fuel

Floating service station literally hurls huge drums of gasoline and oil over dikes to the isolated island asparagus farms in the deltas of the Sacramento and San Joaquin rivers of California.



This small, all-steel and self-propelled service station is shown starting to throw a tank of gasoline over a levee to an asparagus farm, a distance too great for the boom to reach.

MAKING possible the harvesting of the largest crop of asparagus in the world, worth $8,000,000 to the producers in 1929, a novel type of motor-driven agricultural service station has been put to work on the Sacramento and San Joaquin rivers, in central California. These streams, flowing into San Francisco Bay, encircle an area of 300,000 acres, in the form of islands, on which is grown 90 per cent of the asparagus packed in the world, and virtually all the fresh asparagus consumed from the Pacific coast to Salt Lake City and from the Canadian boundary to the Mexican line.

This floating tanker carries to the asparagus growers more than 20,000 gallons of gasoline and oil daily, enabling them to operate tractors, motor-driven seeders, cultivators and pick-up wagons, which otherwise would have to be drawn by animals, since the only highways to these delta islands are waterways. There is also a fleet of small steamers, motor-driven passenger and freight carriers, and barges, which handle other carrying.

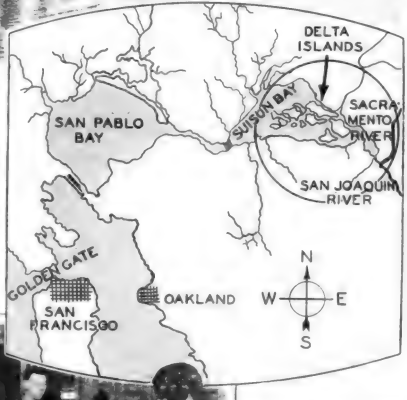
The tanker is all steel, 101 feet long, 23 feet beam, 5.75 feet deep, and drawing only five feet of water when fully loaded with 19,000 gallons of gasoline in its three tanks, and 3,000 gallons of kerosene, or distillate, in one tank. The tanker is driven, loaded, at the rate of eight miles an hour.

There are virtually no landings, docks or piers in the shallow waterways which cut this 300,000 acres into a huge checkerboard, so the tanker merely shoves her nose against the bank, keeps her engines running to hold her there, and unloads her cargo at any farm. The levee banks are high, and so wide that the 40-foot booms on the tanker cannot reach up and over to place the drums on the level top of the levee. But David's sling inspired the engineers who built "Delta Standard," and her winchman literally slings the big steel barrels to the top of the levee, a new process in the unloading of inland-waterway cargo-carriers.

With a double-drum winch, the barrel is hoisted to the end of the outside boom. Then the purchase is let go suddenly, and the weight taken up almost instantly by the steel line from the inner boom. The 500-pound metal barrel zooms shoreside as the inside purchase is let go with a run, and the load swings to the top of the levee or over, if necessary.

To ASPARAGUS Farms

A small steamer is shown above towing $25,000 worth of asparagus on a barge to the San Francisco market, voyaging on the Sacramento river from the heart of the choicest asparagus farming district in the world. A small fleet of steamers and motor-driven passenger and freight carriers is constantly plying between the delta islands and San Francisco in carrying on this industry which supplies the nation with a table delicacy.



This map locates within the circle the 300,000 square miles of islands in the delta of the Sacramento and San Joaquin rivers on which a 1929 crop of asparagus valued at $8,000,000 was raised. Ninety per cent of all the asparagus packed in the world is raised in this small district of isolated islands protected by dikes and levees and serviced by tankers and freighting boats from San Francisco, the primary asparagus market.

Workers are pictured here packing part of the asparagus crop produced in the delta islands of the San Joaquin and Sacramento rivers.

Radio Makers Find

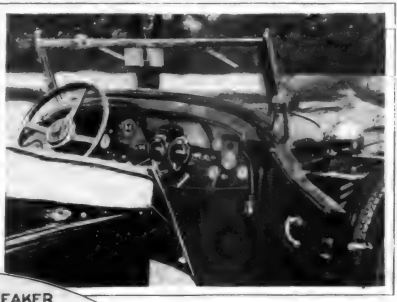
RADIO, which most of us are accustomed to think of as a means of parlor entertainment, is rapidly being applied in novel ways as manufacturers seek for new methods of using sets. Taking a tip from automobile manufacturers who advise the purchase of a second car so that all members of the family may have transportation, radio makers are now recommending that in addition to the parlor radio a second set be bought for installation in the family car.

A number of automobile makers, especially those whose cars sell in the higher price ranges, are bringing out new models with radios built in as standard equipment.

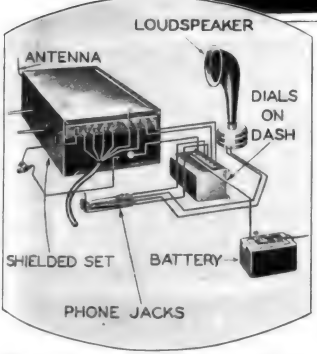
Have you ever wondered how an engineer kept in communication with the conductor of a freight train when the two were separated by 150 box cars? The answer is that usually they don't. But when a radio set is installed in the caboose and another in the engineer's cab, communication is as easy as talking over the telephone. The picture at the top of the page shows how the antenna is erected on the caboose. Directly above is a photo showing the installation of the short-wave set inside the caboose, while at the right the simplicity of the receiving set is well shown.

New Uses for SETS

No longer is radio confined to furnishing parlor entertainment. Manufacturers have found numerous new uses for radio sets which promise to make them an even more important part of our everyday life.



The two large center dials on the dashboard of the car control a radio whose loudspeaker is hidden under the cowl. Such sets can be installed in any car.



This drawing shows how the dashboard radio is hooked up. It will be seen that there is nothing complicated about the arrangement.

Within a few years it is predicted that a radio will come to be as necessary a part of the car's equipment as bumpers and speedometers, which not so many years ago were regarded as luxury items.

Police departments are making increasing use of radio as a means of catching criminals. The broadcasting of information and descriptions regarding criminals has been in use for some time with satisfactory results, but Los Angeles police have recently gone a step farther. Police cars containing plainclothes men, cruising about the city streets, are now equipped with dashboard radio sets. By tuning in to the proper wave length, information concerning robberies can be broadcast to officers all over the city who will immediately be in a position to give chase to suspects without loss of time.

Another application of radio which is finding favor with railroad companies is the use of sets to keep the engineer in communication with the conductor of long freight trains. The conductor, sitting in the caboose, simply tunes in a short wave set and holds a conversation with the engineer who may be a mile or more ahead of him, separated by a long string of cars.

Airplanes have long made use of radio. Recently telephone conversations were held from an airplane 2500 feet up, in communication with a newspaper office. Experiments in the refinement of the necessary apparatus promise to develop sets for airplane use which will be light enough for installation in any plane and which will enable passengers to talk with friends on the ground.

Edited by L. B. ROBBINS

For several years Mr. Robbins has owned and operated amateur radio station W1AFQ. He is also well known as a contributor to popular magazines on numerous technical subjects, having sold more than eight thousand articles on radio alone. This department appears regularly each month under his editorship.

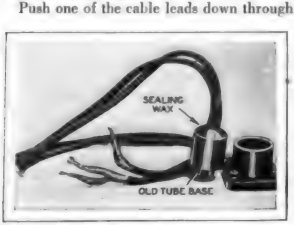
Short Wave Adapter Plug Can Be Made From Tube Base

A PLUG for plugging in a short wave adapter or for using a tube tester on your receiver can be made from the base of a burned out tube by any radio fan. All you need is a little solder, some sealing wax or other insulating compound, and sufficient length of four-wire flexible cable or two pieces of two-wire cable fastened together.

Remove the tube from the base by breaking it away, then clean out the chips with a knife and dig out the cement. Bare the four leads and remove them from the prongs by heating the latter with a soldering iron and knocking out the melted solder with a sudden blow.

Push one of the cable leads down through each prong, double it back and solder in place. Then cut off the projecting wire and file away the wire tip and solder until the prongs present a normal appearance.

Finally, melt some sealing wax in a can and pour the base full, taking care to separate the leads in the base beforehand so there will be no shorts between them. When finished the adapter plug will appear as in the photograph. A five prong adapter can be made in the same way by using a fifth piece of flexible wire.



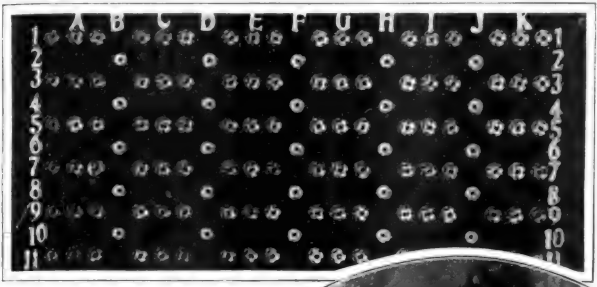
This adapter plug is made from an old tube base.

Preventing Corrosion of Battery Leads

NO matter how careful one may be, in time the insulation of a storage battery lead will be eaten through by the acid fumes. This might cause a dangerous short circuit with fire as a result, but by treating the leads as explained below this disintegration can be stopped.

Melt some paraffin in a tin can until it is a hot liquid. Then drop the leads into it for about ten minutes. This will thoroughly saturate them, after which they can be removed and hung up in a warm room to drain. Such paraffined leads will resist battery acid corrosion a long while. The process is inexpensive and can easily be repeated when necessary.

Set Building Simplified by Standardized Hookup Board

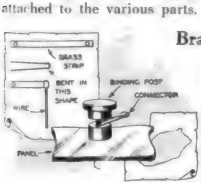


THIS new hookup board will gladden the heart of many a newcomer into radio because of the ease with which it allows the novice to hook up his receiver. It eliminates all wiring from part to part and practically any type of circuit can be employed. Consequently the following of blueprints and diagrams can be avoided and the various items assembled by merely plugging them in the proper sockets in the board.

The hookup board is of black insulating material and rests on rubber pads. In the face of the board are a series of sockets vertically and in a horizontal line, the horizontal lines being numbered and the vertical lines being lettered. All sockets are connected electrically by metal strips at the back so no matter where the parts are plugged in, they will be connected. Thus, by following the diagrams sent with the boards, parts are plugged in according to horizontal and vertical positions and in a jiffy the hookup is complete. Plugs are furnished with the board that can be quickly attached to the various parts.

A new method of hooking up radio sets, so simple that anyone can do the job, is shown above. The various plugs are numbered and lettered so that a child can make the connections.

Brass Strip Makes Handy Binding Post Connector



WHEN wiring radio sets experimentally it is often desired to connect a number of wires to one binding post. The little device shown in the diagram at the left will make this possible. It consists simply of a thin brass strip bent as shown, with holes punched through either end to fit over the post rod. When the binding post is screwed down the connector is tightened securely on the wire or wires and a perfect contact secured.—B. G. Switzer.

A Series Parallel Switch Used for "B" Battery Charging

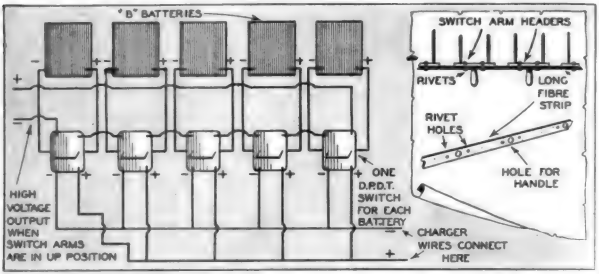
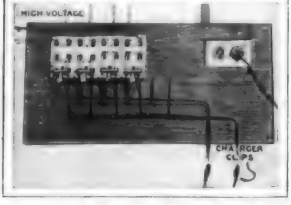


Diagram and details of the series-parallel battery charging panel showing hookup and connections.

MANY fans are still using B batteries, some from necessity and others from preference. Those using the storage Bs, however, find it more or less troublesome to charge them, especially when they are in 25 or 50 volt units and several of such units have to be charged to bring the desired voltage up to the maximum; say that of 150 to 200 volts or even more to operate a power tube. Unhooking the batteries every once in a while to charge them and then hooking them into the set again certainly does get tiresome, but by adopting the series-parallel switching arrangement shown herein all that trouble can be easily eliminated. Just throw the switch one way and you are ready to charge. Throw it back in the opposite direction and the batteries are in series again ready to operate the set. In the panel arrangement shown in the photograph, four 100 volt blocks are charged in parallel and quick as a flash can be connected in series for use with a large power tube. It's no trouble at all and the switching outfit is simple to assemble.



Photograph of the charging panel ready for use.

Use as many double throw, double pole switches as you have batteries. Arrange them on a convenient panel or wall, side by side in a row. For the sake of uniformity use the left side of each switch for the minus line and the right hand side for the plus. For the charging, fasten one end of a heavy, insulated copper wire to the left hand bottom terminal of the left switch. Then bare the insulation directly under the left hand lower terminals of the remaining switches and solder on vertical branches of wire and connect them to these remaining left lower terminals. Tape the soldering, shellacking the tape down to keep it in place.

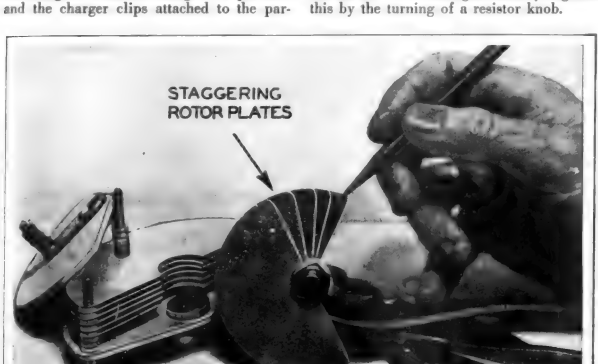
Now do the same thing with the lower right hand terminals of all the switches and when finished you will have all the minus and all the plus lower switch terminals connected; minus to one wire and plus to another. Label them at their free ends for identification.

The top left terminal of the left switch is now the minus terminal for the high voltage line when the switches are in series. Connect all the other top switch terminals together as indicated. This leaves the top right terminal to act as the high voltage plus terminal.

Full Charging Voltage Divided Equally to Each Battery by This Switch

Now connect an individual pair of wires to each switch arm in the center of the switch. Again the left wire is minus and the right is plus. Lead the proper wire of each pair to the corresponding terminals of a single B battery.

The photograph shows a Duplex receptacle installed in the panel convenient for the charger. With the charger in operation and the charger clips attached to the parallel charging wires simply throw all the switch arms down. This immediately places the batteries all in parallel so that the full charging voltage goes to each while the current is divided equally to each one. With a Tungar charger the increased current needed in B battery charging is taken care of by the insertion of a larger bulb in the socket. Other chargers usually regulate this by the turning of a resistor knob.



Straight Lining Old Variable Condensers Aids Reception

THE old style condenser with its semi-circular plates does not always serve as the best means of tuning in a station's wave, particularly when it is at the top of the spectrum. To enter these higher frequencies the newer condensers have their plates narrow and pointed at one side so the rotor will offer less surface to the stator than when the plates are more fully meshed. An old style condenser can be altered so it will effect a similar condition by staggering the rotor plates as shown.

Remove the nuts holding the rotor in position and then remove the latter. Carefully loosen the retaining nut at the end of the shaft so the plates swing free. Then tighten up the nut just enough to pinch them and carefully push the leading edge of each plate slightly ahead of the others. When properly placed they will have the appearance of a fan partially opened. When all are about evenly stepped along tighten up the clamping nut and reassemble the rotor in the stator again. Further efficiency can be realized by entirely removing the rotor plates, arranging them on the bench in the fan style and then cutting plates at one end off evenly, leaving only one end staggered. This requires a sharp jeweler's saw or sharp cutting shears and a heavy vise to straighten the plates after they are shaped. The first method will do wonders, however, in distributing the stations more evenly along the dial.

Learning How to Transmit and Receive Code by Radio

The above photo shows the ideal position of the fingers when operating a telegraphic key. The thumb does not touch the key, which is operated by the first two fingers only. Other fingers are permitted to hang loosely.

INTERNATIONAL MORSE CODE

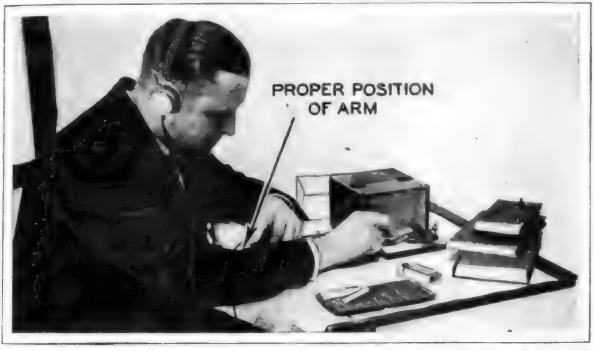
A	·—
B	—···
C	—·—·
D	—··
E	·
F	··—·
G	——·
H	····
I	··
J	·———
K	—·—
L	·—··
M	——
N	—·
O	———
P	·——·
Q	——·—
R	·—·
S	···
T	—
U	··—
V	···—
W	·——
X	—··—
Y	—·——
Z	——··
1	·————
2	··———
3	···——
4	····—
5	·····
6	—····
7	——···
8	———··
9	————·
0	—————

The code symbols used in radio transmission.

THE unusual impetus given to short wave transmission and the consequent use of short wave sets in the home for receiving these programs has also caused many listeners to wish to be able to read the code. This has then led those who have learned it to aspire for an operator's license that they might also transmit. Now one may plod along and learn to receive by merely listening to slow-operating stations and "sticking to it" until certain signals begin to mean something. But the best way is first to learn the code thoroughly by memorizing the dots and dashes visually. Thus the symbols of the letters and numerals are visualized so they can be written down unhesitatingly as fast as they are called out by a second party at random. This can best be accomplished by following a favorite trick of old operators, writing page after page of characters in the dot and dash as rapidly as possible. A week of this practice in filling two or three pages an evening and the beginner will surely have the code well in mind, visually at least.

Learn by Listening

The next step is to *listen* to the signals, either with a buzzer operated by another person or by finding a very slow moving station and copying the signals as best one can as they move along. This will be like beginning over again, but the previous training will be found an excellent preparation. At first single letters will be recognized, then perhaps two or three letters can be picked out until finally, by careful and painstaking listening, whole words will be copied. One thing to remember is that if you miss a character or letter, do not try to think what it is but pass right along to the next, putting down only those that are recognized. Let the gaps take care of themselves. In time you will find it easy to write a character while listening to the next one and as progress is made you will eventually be able to write a whole word or maybe two words behind the message all the time it is going on. Experienced operators can even keep up a conversation



Position of the arm and body in sending is important. Photo shows proper position, in which the forearm is so supported on the table that muscles do not become stiff after a few minutes' sending.

with someone, at the same time listening to a message and copying it down. At any rate, easy copying comes only with experience and long, patient practice. No one can gain speed immediately. Just keep listening and copying what you can and in time your speed will increase almost unconsciously to a point where you will feel well able to pass the minimum test, that of ten words per minute.

Transmitting the code will, of course, come easier regarding speed than receiving because you will already know the characters. But the proper operation of the key will have much to do with your transmitting speed. This means using an ordinary key. The "bug" or speed key is only for the man already experienced in sending. Position and handling of the key has much to do with good sending. The man with a poor "fist" exists only because he insists on doing things his own way and not following the best procedure as proved by old and experienced operators.

First, adjust your key for easy action with just enough spring tension to make snappy contact with a minimum of space between contact points without sticking or arcing. Good, easy but snappy key action is positively necessary. Place the key on a firm support and so the forearm can be wholly rested in front of it if desired. Operate the key knob with the first two fingers of the hand and with the joints bent about as shown in the photograph. Let the thumb rest alongside the side of the knob, just touching it, and then allow the two remaining fingers to hang loosely at the other side of the knob. This will be found to be the easiest position in which to grasp the lever. Keep the wrist raised from the table but rest the arm from about half way back to the elbow. In this way long periods of operating can be obtained without producing a "glass arm" so common to stiff and unnatural positions of the hand.

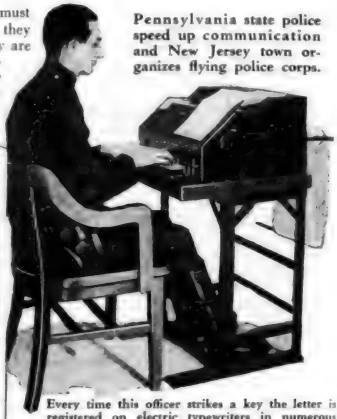
By forming the habit of listening a half hour and transmitting the same length of time each day a beginner will find that at the end of a month he will probably be able to do "ten per," both at the headphones and at the key. In two or three months, speed will increase and following the code will be less of a struggle, while after six months transmitting and receiving, code will become second nature and a new world will be at your command. The time consumed in practice will be no more than that used in learning to play the piano or the saxophone, and think of all the fun you'll have in future years.

Teletypewriters and Airplane Cops Trail Eastern Crooks

EASTERN criminals on the "lam" must move faster than ever today if they want to make good their escape for they are being trailed by teletypewriters and airplane police. The Pennsylvania State Police have been provided with teletypewriters distributed in five zones throughout the state. Alarms and descriptions of crooks as written on the typewriter in the sending office are received throughout the state on electric typewriters just as fast as the sender can write. And in Bergen county, New Jersey, Peter J. Siccardi, chief of the traffic squad, has organized a squad of five flying police officers.

A Pennsylvania state policeman is reading the typewritten description of a crook who is wanted, the message being received by wire on his teletypewriter as it is written by the sending officer in another city.

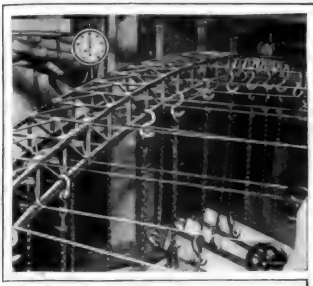
Pennsylvania state police speed up communication and New Jersey town organizes flying police corps.



Every time this officer strikes a key the letter is registered on electric typewriters in numerous distant towns.

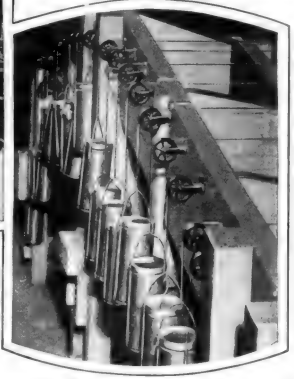
Here is Teterboro's flying police corps, left to right: Pilots H. I. Wells, Lieutenant Clyde Pangborn who is known as "the upside down flyer," Peter J. Siccardi, the organizer and head of the corps; C. S. Allen and Walter Jones.

Exact Model of Great Bridge to Test Strength



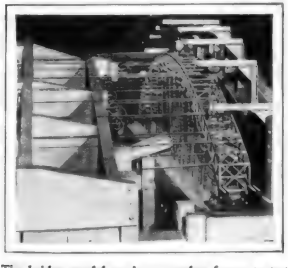
A section of the model span showing the federal gauge which registers bending of the bridge to a fractional thousandth of an inch standard.

Standard gauge measures bending of the bridge under various loads.



The rear of the model bridge showing weights suspended over pulleys to determine wind pressure against the bridge.

AN EXACT bronze model of the Kill Van Kull bridge from Staten Island, New York, to New Jersey, was constructed by engineers to be subjected to tests. A variety of tests for load capacity and wind deflections was given with the federal gauge registering the bending of the bridge to the fractional thousandths of an inch. The model went through the tests and was found to be absolutely safe. On the basis of these tests, work was ordered to proceed on the bridge and construction is now under way. When models are subjected to such tests it is easy to remedy weaknesses.



The bridge model set in a wooden frame to test load capacity and wind deflections.

Fewer People Live To Be Old

THE surprising idea that human life is growing shorter instead of longer, recently suggested by Professor C. H. Forsyth of Dartmouth College, receives unexpected corroboration from statistics of people living to be over 100 years old in the British Isles, compiled recently by Dr. Maurice Ernest of the Centenarian Club, in London. In 1881, Dr. Ernest finds, England possessed 141 centenarians, Scotland had 57 and the present territories of the Irish Free State reported 566. In 1921, which year represents the most recent complete census, the corresponding figures were 110 in England, 35 in Scotland and approximately 120 in the Irish Free State. It is conceivable, Dr. Ernest notes, that the larger numbers of centenarians reported in the earlier years may have been due to false claims of extreme old age made by the persons themselves and not checked as carefully as now. Women who live beyond a hundred appear to be twice as numerous as men.

Edited by MAJOR H. H. ARNOLD

"Flight Tutor" Tests Each Student's Aptitudes for Flying

VISITORS at Army Air Corps flying schools may very well think that they are in an amusement park instead of an aviation school when they see the flight tutors for the first time. These strange looking devices seem to be quite out of place amid the school buildings and training planes. However, they have a distinct mission in the training of flying officers.

It has been roughly figured that it costs about $10,000 to train each graduate of the flying schools. Those who do not make the grade represent expenditures in proportion to the time that they spend at the schools before being washed out. Naturally if they crack up a plane during their training the expense mounts. Accordingly every possible means is employed to determine the likelihood of a candidate's making the grade as soon as possible.

The standard of candidates reporting for the preliminary examinations varies from year to year. There have been as many as 50% disqualified in the physical examinations. The mental tests take their toll of men who are not up to standard. Those who successfully complete this part of the examinations might well be expected to graduate from the flying schools, but such is not the case. There have been years when only about 50% of those who start the flying training finally graduate.

Naturally there would be a big saving in money and in some cases of lives if there was some means whereby it was possible to determine definitely whether or not a candidate could learn to fly. While the flight tutor can not be considered infallible in this respect it gives prospects of developing into something which in the future may be able to solve the problem. In addition it gives valuable training to students.

Major H. H. Arnold is a recognized authority in the field of the airplane, being the author of a number of widely accepted text-books on aeronautical subjects, as well as a practical flyer of long standing.

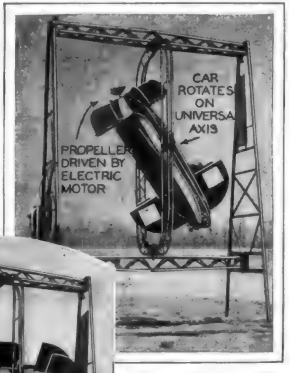
The flight tutor is nothing more nor less than a car mounted on three axes, all perpendicular to each other. This car is equipped so that as nearly as possible it resembles the cockpit of an airplane. It has a seat for the student flyer, a stick which controls fore and aft and lateral stability, and rudder bar to control movements toward the right and left. The stick is connected electrically so that movements to the right or left turn the car around a fore and aft axis. Similarly movements

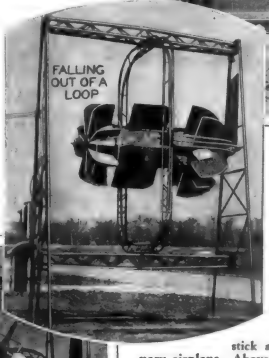
Aero Car Swings on Three Axes in Teaching Student Aviators to Fly

of the stick forward and backward cause the car to move around a horizontal transverse axis through the car. Movements of the rudder bar cause the car to rotate in a horizontal plane around a vertical axis.

A combination of stick and rudder control will give the car any movements desired. A propeller, mounted in front of the car and driven by an electric motor, throws a blast of air around the car, thus simulating the slip stream of the propeller in an airplane. The controls move and secure just as quick response as those in a plane.

The flight tutor can be used in one of two ways: the student can be allowed to work the controls at will or carry out instructions given by the officer supervising, or the student may be required to maintain the car in in a horizontal flying position. In the latter case the instructor manipulates a set of





Operated by a propeller driven by an electric motor, the novel "flight tutor" shown in the photographs has been designed to teach students the elements of flying, and to test their ability in learning how to handle a plane. The propeller blast controls the movements of the car by its reaction on the control surfaces which are manipulated by control stick and rudder as in an ordinary airplane. Above, a student is shown climbing his ship, while the center photo shows him upside down at the top of a loop.

Above the student in the flight tutor is just bringing his "airplane" out of a dive. Note the numerous fin surfaces controlling the car.

controls from the ground and puts the car in such motions as he sees fit. The student then endeavors to neutralize those impulses by using the stick in the car.

The flight tutor demonstrates the movements resulting from moving the stick, shows the aptitude of the student in picking up the use of the controls, and clearly determines the co-ordination or lack of co-ordination between the mind and muscles of the student. Practically any maneuver possible to an airplane, except cracking up, can be duplicated by the flight tutor.

It cannot, of course, supplant actual flying as the best means of instruction.

Inflatable Bags Under Wings Float Planes Which May Land on Water

PROVISIONS are made in modern land planes which must fly over water to prevent their sinking in case of a forced landing. A close inspection of the upper wing of U. S. Government planes which have missions taking them some distance from shore, would reveal two rectangular plates on the lower surface. Each of these plates cover compartments that contain canvas bags compactly packed. These bags are connected by tubing to a flask also contained in the upper wing. This flask is filled with compressed air.

When it is apparent to the pilot that a forced landing must be made in water, he pulls a lever or cable. This turns on the compressed gas and throws off the covers of the flotation bags. The bags are inflated as they emerge. They are large enough to keep the plane above water for several hours. Pilots have made forced landings on the water in planes so equipped and have been rescued without even getting their feet wet.

The customary method of using the flotation bags is to wait until the plane has hit the water before opening the valve on the gas flask. By attaching the bags to the upper wing, all dangers of losing them in the crash are removed. If they were attached to the lower wings they would be almost sure to be lost.

Has the Ultimate Airplane Altitude Record Been Set?

TO date man has covered the strata surrounding the earth's surface from a depth of 6000 feet below sea level to an altitude of 42,000 feet above.

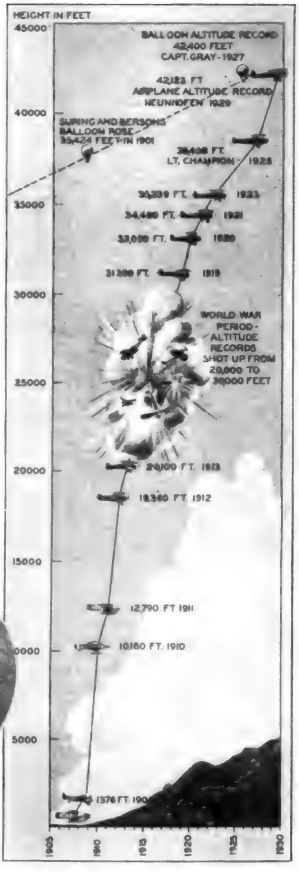
In 1901 Suring and Berson (Germans) climbed their balloon to an altitude of 35,424 feet, a record which stood for several years. In 1927 Capt. Hawthorne Gray, U. S. Air Corps, ascended to a height of 42,400 feet. During the descent his balloon began to drop with great rapidity, much too fast for safety. When he realized that he could not regain control, he jumped from the basket and came down safely in his chute. In November of the same year he made another attempt and reached an altitude of 42,470 feet. However, his oxygen gave out during the descent at an altitude of about 39,000 feet. Gray became unconscious and the balloon came down unaided. When the balloon was found the next day Gray was in the basket, dead.

Airplanes have been taken to a height of 42,183 feet. Maj. Schroeder and Lt Macready, both U. S. Army, reached 34,000 feet or better. In his flight Schroeder became unconscious on account of trouble with his oxygen line and after falling some

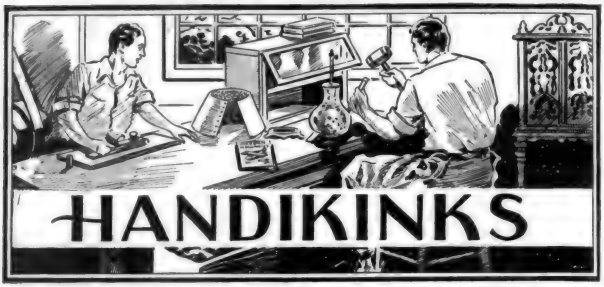
10,000 feet, regained consciousness and brought his plane down safely. Lt. Champion, U. S. Navy, holds the present American record of 38,418 feet. Neunhofer, a German, holds the world's record of 42,813 feet.

During the earlier of these high altitude tests it appeared as if a west wind having a velocity of some 200 miles an hour was ever present above 30,000 feet. The value of this wind in commercial air operations is evident. However, at the present time there is grave doubt as to this wind always blowing in the same direction and at the same velocity.

Lieut. John Macready, famous for his pioneer altitude flights, is shown above dressed in the fur-lined, electrically heated suit used in altitude flying. A special helmet which permits breathing of oxygen from a special tank is also necessary above heights of 30,000 feet, owing to the rarefied air. Engines of planes used in altitude attempts are now almost invariably equipped with superchargers which assure an adequate supply of fuel to the cylinders. At right is shown a balloon of the type used by Capt. Gray.

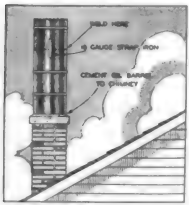


The steady increase in airplane altitude records is graphically shown above. Note how the airplane has approached the heights set by balloons.



Short-cuts in doing everyday tasks—novel methods of using waste products for useful purposes—time-saving stunts for the kitchen, the workshop, the home—all such "handikinks" appear regularly in this department each month. You can make use of them!

Two Steel Oil Barrels Make Chimney Extensions to Create Good Draft

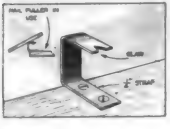


IF THE chimney of the house or cottage is too short to create a good draft for the fire, it can easily be extended in the manner shown in the drawing at the left. Two steel oil drums are placed end to end, the bottoms being removed, and are either welded together by a blacksmith or riveted with strap iron to form a cylinder. The barrels can then be stood upon the chimney top and cemented into place with concrete. It is, of course, quite possible to construct an entire chimney out of these barrels, and when completed it will be absolutely fireproof. In case you use more than three or four barrels at the chimney top you will have to use wires to stay them to nearby trees.—Alfred Allard.

Using a Pair of Ordinary Shovels as a Post Hole Digger

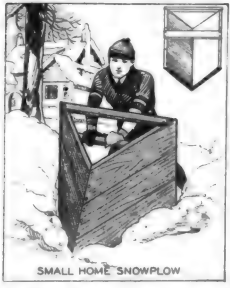
POST holes can be dug without a special digging device if you have two ordinary shovels at hand. The simple method is shown in the drawing at the right. The shovels are tied together as shown with a length of rope, just where the bend comes where the shovel is fitted to the handle. The two shovels thus act like a pair of scissors; when the handles are spread apart the dirt is pinched between the shovels and removed. Long handled shovels should be used in digging deep holes. Whenever holes are to be dug straight down, this method will be quite satisfactory.—B. Thompson.

Bench Nail Puller Works Better Than Claw Hammer



WHEN many nails are to be removed from pieces of lumber, as in wrecking old buildings, much time is lost in wrestling with the lumber if an ordinary claw hammer is used. A metal hook, installed on a bench as shown in the drawing at the left, draws nails out of boards easily.—Bert Fraser.

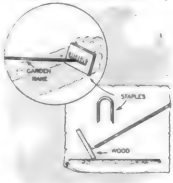
Getting Ready for King Winter


SMALL HOME SNOWPLOW

Snow Removers for Your Home Sidewalks

SOON Old Man Boreas will be back on the job, bringing with him a foot or two of snow which must be removed from streets and sidewalks. Householders who don't look forward with any degree of enthusiasm to working on the business end of a snow shovel will appreciate any shortcut which will make the snow removal task easier. A small home snowplow, built like the one shown in the drawing at the left, will settle the problem nicely. No dimensions are given because the size will naturally vary to suit individual conditions, but the design is so simple that anyone can knock it together in a few minutes, the only tools required being hammer and saw. In cutting the planks, which should be 2x8's or 2x10's, bear in mind that they must not only be beveled to form a V-joint, but that the bottom of the snowplow must project a few inches farther to the front than the top in order to get the proper shape of cutting "nose" on the plow. One brace across the top, another at the rear for the shoveler to push on, and a strip on either side inside the plow to hold the planks solidly, complete the plow. A strip of tin or galvanized iron tacked to the bottom will prevent the wood being worn away in use.

A simpler snow remover is shown at the right, in which half a dozen staples are driven into a board to hold the tines of a garden rake. This device can, of course, be used only when the snowfall is light, but it will clean a sidewalk with surprising speed and can be made in a few moments when the shovel is missing.—Ray Champion.

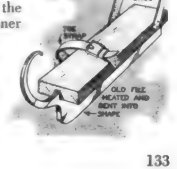


Furnace Oil Obtained by Filtering Old Auto Oil Through a Felt Hat

OIL drained from automobile crankcase can be used in oil burning furnaces or as lubricant in farm machinery if it is filtered by the simple method shown in the drawing at the left. A soft felt hat is fitted into the top of a pail or other container and the dirty oil is poured into it. When it has all filtered through, the clean oil can be reclaimed from the bottom of the pail. If the oil to be filtered is more than ordinarily thick it should be heated before pouring into the hat.—A. C. Wilson.

Making a Pair of Ice Skates from Two Old Files

THE skate shown at the right has a runner made from an ordinary file, which must be heated red-hot and then bent into the shape shown. After the shaping has been done, grind the runner edge smooth on an emery stone and also remove the corrugations from both sides. Then round off the lower front edge of the skate runner. Next get two pieces of hardwood, ¾-inch thick, 3 to 4 inches wide, and as long as your shoe. Make a groove half way through the wood exactly in the center, to accommodate the runner. The groove must be narrower than the thickness of the file.—Dale R. Van Horn.

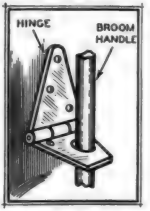


Simple Devices for the Home

Potato Slicer Made From Plane

AN OLD plane which is out of line or otherwise unfit for shop use makes a handy slicer when used as shown in the drawing at left. The blade can be set to bite at the desired thickness for slicing potatoes or chipping soap.—Theodore Allen.

Handy Broom Holder for Kitchen



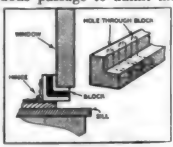
AN ORDINARY hinge makes a good broom holder when mounted along the wall as shown in the drawing. A hole is drilled in the loose flap and when the broom is inserted its own weight keeps it taut against the wall. —George Bailey.

Old Fork as Handy Can Opener

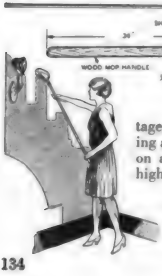
SYRUP, paint, and varnish cans commonly are made with covers which fit into the top tightly and must be pried up to open. Many a knife blade has been broken in a fruitless attempt to pry open such lids. A simple tool which will be a handy addition to the kitchen utensil drawer can be made from an old fork as shown in the drawing at the left. When the fork is filed down to the shape shown it can be inserted under the lid and will lift the most obstinate cover. — Al Schroeder.

Draftless Ventilator for Window

AN EXCELLENT ventilator which insures a continuous supply of fresh air can easily be made from the design printed below. A wooden block is secured as long as the width of the window and one square corner cut out to form a groove. Then holes are bored at right angles with bit and brace to form a continuous passage to admit the air. When the block is hinged to the sill, as shown in the drawing, it can be turned back and the window lowered. — Dick Mangan.



A Mounted Sponge for Wall Cleaner

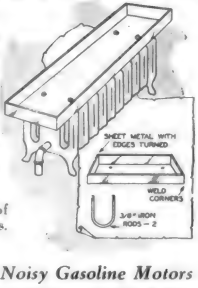


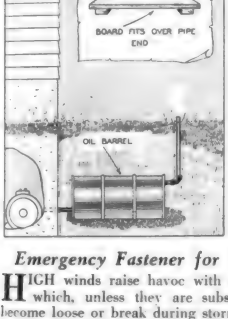
ERASING qualities of an ordinary rubber sponge of the type which can be obtained in any drug or department store are taken advantage of in making the convenient wall-paper cleaner shown in the drawing at the left. The sponge is clamped into a metal holder and mounted on a broom handle which makes it convenient to reach ceilings and high walls. Two pieces of sheet metal are required for the clamp, shaped approximately as shown. Punch a hole through the pieces to permit a bolt and wing nut to be inserted for tightening the sponge in place. In using, stroke the sponge evenly and gently in one direction.—R. M. Koch.

Of Interest to the Homemaker

Tops for Radiators Make Handy Drying Tables

OFTEN there arises around the house the need for a drying rack of some sort on which freshly painted articles, etc., may be set out to dry. The top of a radiator furnishes the ideal location for such a stand. The drawing at the left shows a typical installation intended especially for home workshops where it is also useful as a handy tray for small parts which are continually getting lost. A strip of sheet metal of appropriate size is turned up at the corners to form the tray, the corners being welded. The mounting arrangement is simple, consisting of two iron rods of $\frac{3}{8}$-inch thickness or greater, threaded at both ends and bent into a U-shape. These brackets fit around the top core of the radiator.—G. A. Luers.



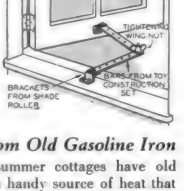


Oil Barrel Silences Noisy Gasoline Motors

MANY farm homes nowadays are equipped with their own electric lighting plants in which the current is generated by gasoline motors. These motors often make themselves objectionable by their noisiness. A good muffler can be made from an old steel drum of the type in which oil is delivered. Bury it in the ground outside the house, fitting a pipe into one end which runs up to the surface for the exhaust. The exhaust pipe of the motor is then led to the other end of the barrel, which muffles the sound when the motor is running. The open end of the pipe should be covered with a board to protect it from filling up with dirt.—Bert Hill.

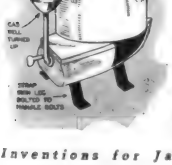
Emergency Fastener for Casement Windows

HIGH winds raise havoc with casement window fasteners which, unless they are substantially made, frequently become loose or break during storms. An emergency fastener is easily made to serve until a new one of standard make can be secured. Shade roller brackets are fastened to sill and window sash, and connected by means of two flat bars from a toy construction set. A wing-nut tightens and holds the brace at any desired position. Washers should be used under each bolt-head and nut.—Hi Sibley.

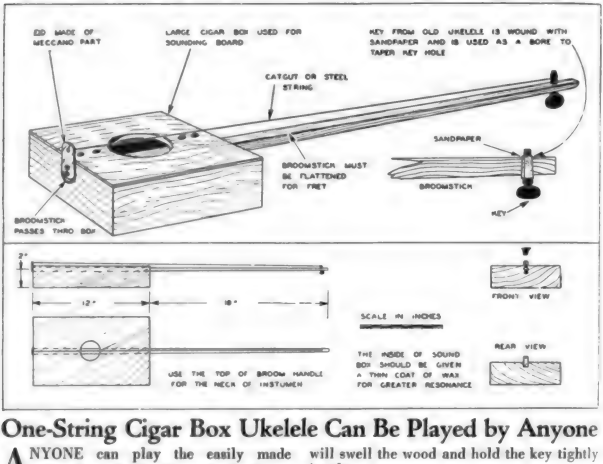


Efficient Little Stove Made from Old Gasoline Iron

MOST farm homes and many summer cottages have old gasoline flatirons which make a handy source of heat that can easily be carried around. The hardware store of any small town will sell or give you a gasoline iron which has been taken in on trade on an electric one. Such an iron can be made into a fine little stove by inverting it, putting the strap legs on as shown in the drawing, and turning the gasoline well upside down. The bottom of the iron can be heated to any desired temperature and will keep food warm a long time.—Kenneth Kennedy.



A Home-Made Musical Instrument



One-String Cigar Box Ukelele Can Be Played by Anyone

ANYONE can play the easily made cigar box ukelele shown in the drawing above. Take a large cigar box which is in good condition, scrape all the paper off, and sand the wood to a nice finish inside and out. Holes large enough to admit a broom handle are bored on opposite sides of the box and the handle nailed in place. Nail the lid on and flatten the top of the broomstick, which should project about 18 inches. The cigar box acts as a sounding board, and the quality of the tone will be improved if the inside is given a thin coating of wax to increase resonance.

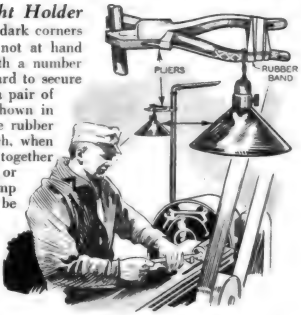
Fret is the musician's name for the metal cross bars on the necks of ukeleles. In this ukelele, however, frets are too troublesome to make and the player will soon learn to depress the string at the right spot to produce a desired note, pressing down hard with the finger nail so that the string will vibrate clearly. Next put in the string key, boring a hole through the broomstick just large enough to admit the small end of the key. Wrap sandpaper around the key and twist it around until it has formed a tapered hole of the desired shape. A drop of water will swell the wood and hold the key tightly in place.

The fid, or supporting piece at the other end of the string, is next screwed securely in place. Be sure to get it tight and not so high above the box that it will bend. Now cut a sounding hole in the box at the point where the hand strikes the strings. Several different types of string can be used such as the usual G string of catgut or a steel guitar string. It is a characteristic of this home made instrument that it will take on the tonal qualities of the string used in it. In addition it has an added mellowness due to the fact that there is only one string without three or four other strings to vibrate in sympathy. All the notes are pure. Tunes are produced by experimenting until one learns at what points the string must be depressed to produce desired notes. The process is much like learning to whistle and can be mastered by anyone in a few minutes. With a mandolin string in E and a violin bow, several stage performers have used this home made uke with success.—T. S. Asgaard.

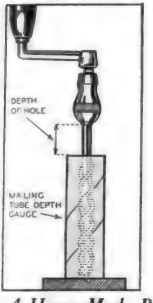
Stunts for the Home Workshop

Rubber Band on Pliers Makes Light Holder

WHEN working around machinery or in dark corners a source of artificial light is usually not at hand when wanted. Usually the room is fitted with a number of lamps on extension cords, but these are hard to secure in position. A neat light clamp made up of a pair of pliers and a rubber band can be made as shown in the drawing at right, for emergency use. The rubber band should be of the wide, flat variety which, when wound around the pliers, will clamp the jaws together in a firm grip. Any convenient pipe, bracket, or metal mounting will serve for the jaws to clamp on, and the light cord holding the lamp can be draped over the handle.—Robert E. Larkin.



Mailing Tube Gauges the Depth



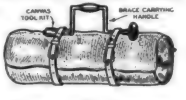
OFTEN when setting dowel pins or making mortises a gauge is needed to regulate the depth of the hole bored by auger. The drawing at left shows how a cardboard mailing tube has been made use of for this purpose; in the drawing the width of the tube has been purposely exaggerated to show how it is used. —Theodore Allen.

A Home-Made Rubber Hammer

RUBBER hammers come in handy around the home workshop for pounding out dented automobile fenders and similar purposes. In case your home toolkit does not contain a rubber hammer, you can easily make a substitute. Simply take an ordinary clawhammer and slip a rubber crutch tip over its face, as shown in the drawing. It will serve its purpose quite as well as the more elaborate rubber hammer.—Lester P. Young.

Carrying Handle for Tool Kit

TOOLS kept in a folding canvas toolbag can be carried conveniently by using the brace as a handle, as shown in the drawing below. The brace is left outside the bag and the canvas straps which hold the saw, plane and other tools in the roll are tied around it, resulting in a neat appearing and handy carrying handle. — Russell Kutz.



Wood Planing Kink

WISHING to plane several small strips of wood 1/4x5/16 inches, the writer turned a joiner plane bottom side up in a vise. Then a block of wood 2x2 inches in size was clamped to the plane, covering about half the bit. To this, directly over the bit and clearing it about 1/8 inch, was clamped a wood spring similar to the one shown in the drawing. A dandy job of planing was done by drawing the strips between the spring and bit.—L. M. W.

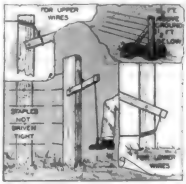
Ideas for the Farm Home

Smokehouse Made from Barrel and Old Stove

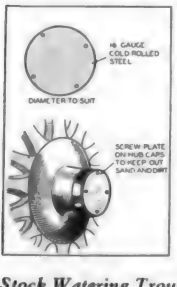
HAVE you ever been on a camping or hunting tour and bagged more game than you could use at camp? By smoking the surplus it can be preserved for future use. It doesn't take any elaborate equipment to construct a smokehouse; the one shown in the drawing at left will be a welcome piece of equipment for the farm home which does not boast a regulation smokehouse. All that is needed is a pickle barrel and a castaway stove. The barrel is rested with one side on a stake and the other over the chimney.—T. S. Asgaard.

How One Man Can Erect a Taut Wire Fence

IT IS an almost hopeless job for one man to attempt to set up a wire fence all by himself without special tools. It is easy to put in the posts, but tightening the wire is something else again. By the method illustrated at the right, however, one man can do the whole job satisfactorily. First install the end posts. Nail cross pieces on the post base and brace and set into the ground at least 18 inches. If the soil is wet around the post, it will have to dry out before it is solid enough to hold the post in position against strain.



Holes for the wires are bored through the terminal posts at a 25 degree angle so that strands can be drawn through tightly without binding. Nail a board to the post as shown, with a loop for the foot, to act as a lever in drawing the wires taut. The wires are stapled loosely and are fastened down solidly after the wire is drawn taut.—Hi Sibley.

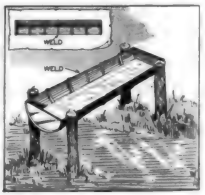


Dust Cap for Wagon Hubs Gives Longer Life

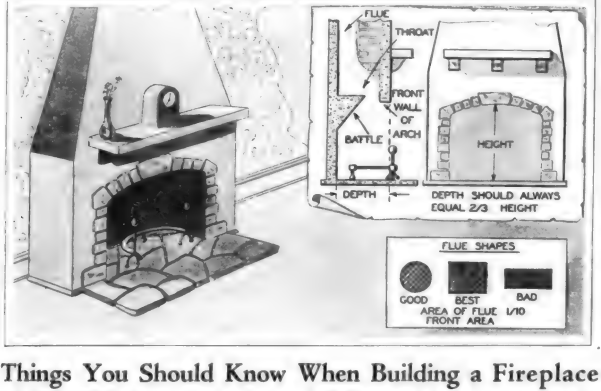
MOST vehicles such as milk wagons, farm wagons, etc., are built with open axle hubs which have to be greased frequently to keep them running well. Sand and road dust mixes with the grease, forming an abrasive which is apt to cause unnecessary wear. One way to prevent this trouble is to make small sheet metal covers of just the right size to fit the hubs of the wheel, mounting them in place with screws as shown in the drawing at the left. When made of nickel plated metal will also add to the appearance of the wagon.—William Swanberg.

Stock Watering Trough Made from Oil Barrel

A STEEL oil drum makes an adequate substitute for the more expensive metal watering trough when fitted up as shown in the drawing at the right. Cut the barrel in two lengthwise; a blacksmith can do this job with an acetylene torch in a few minutes. The top of the barrel is removed and the two halves welded together as shown, forming a continuous trough. Strap reinforcements will add to its strength. When mounted on a wooden trestle of the correct height for stock to drink from, it will make a durable and satisfactory piece of farm equipment.—Ralph Carlson.



Hints on Fireplace Construction



Things You Should Know When Building a Fireplace

IN BUILDING a fireplace in the home or cabin, the object, of course, is to so construct it that the smoke will go up the chimney and the heat will be reflected out into the room. If unscientifically constructed, smoke is likely to fill the room as well as heat, or both smoke and heat may go up the chimney, leaving the room cold. Relation of depth to height of fireplace is important, and can be determined by two simple rules. First, the minimum depth of any fireplace from front to back is 28 inches; second, the depth of a fireplace with a brick throat must be at least two thirds the height of the fireplace opening.

The throat of the fireplace serves to reflect some of the heat and at the same time direct the smoke up the flue. Some of the heat must of course rise with the smoke; some is radiated out into the room by an oblique surface which may be called the roof. This roof must be high enough at its top so that it throws smoke against the inside face of the arch rather than out into the room. The opening between roof and front of arch must be small enough to retain much of the heat, yet large enough to admit all smoke to escape. A safe rule to follow here is to make this opening one tenth the area of the front opening of the fireplace. If the fireplace is three feet high and four feet wide, you have 12 square feet, of which one tenth is 1.2 square feet or 172 square inches. Making the throat as wide as the fireplace, four feet, you will thus have a minimum depth for the throat of a little more than three and one-half inches. Four inches would be better.

Build your flue as straight as possible. A round flue is the most efficient, eliminating much friction, but a square flue is almost as satisfactory and is easier to build. A rectangular flue is least efficient. Make the inside of the flue as smooth as possible. One way is to plaster it, but the plaster may chip off and there is likelihood of fire arising from a defective flue. The safest way is to line the flue with tile; such liners are required by many city ordinances. Carry the flue well above the ridge of the roof and you will not be troubled with back drafts. A flexible throat purchased at a hardware store will be an appreciated aid in controlling the fire. These throats are adjustable to various conditions of the fire, and will usually more than repay the moderate expense of installation. They are not, however, indispensable.—Claude H. Cook.

How to BUILD the

Here is Mr. W. H. Bowlus, veteran aircraft constructor, who has built 16 gliders. His "Sailplane," described here, has made flights of better than fourteen minutes, unassisted by power.

The picture above was taken while the Bowlus Sailplane was soaring at an altitude of 60 feet near San Diego. The beautifully streamlined form is clearly depicted in this action photo.

WHEN I started to build this sailplane in the shops of the San Diego Air Service Corp., it was at first proposed to build "just another glider." We then saw that refinements could be incorporated which would produce a true sailplane.

The only difference between a sailplane and a glider is the gliding angle and head resistance. A well-designed sailplane is of high aspect ratio, wings internally braced and with very little parasite resistance. It should be capable of a large gliding angle, above 20 to one.

Gliders are generally capable of gliding from a hill top or after being towed for a distance, rising a few feet, then descending. Generally gliders are externally braced with wire struts, with either open or closed fuselage. Head resistance seldom is given much consideration.

Sailplanes are very safe machines when operated properly. They should "handle" easily because of their light weight; this, of course, assuming proper design and construction.

The sailplane generally weighs between 150 and 300 pounds and the pilot between 150 and 180. Here, then, you have a total weight not exceeding 480 pounds. In event of a crash or other mishap the weight element need not be considered.

It is noteworthy that in the average sailplane crash the pilot seldom is injured in any way. I recall an instance when a glider of mine smashed into the side of a hangar. My only physical disablement was a bruised shoulder.

One should not deduce from this that sailplanes are uncontrollable. That mishap resulted from a mechanical imperfection charged against a workman. The sailplane is controllable in the air to the very last degree.

Its controllability is even better than the average power driven ship because of large surfaces moving at greater angles. The

Bowlus Sailplane

By WILLIAM H. BOWLUS

As Plant Manager of the B. F. Mahoney Aircraft Corp., at San Diego, Mr. Bowlus was the actual builder of Lindbergh's famous Spirit of St. Louis. He has built 16 gliders, the latest of which—the first "All American" sailplane—is described in this article.

sailplane can be controlled at stalling speeds and controls are very effective even at those low speeds.

So easily may a sailplane be handled that I think it would be possible under proper conditions for one to fly a sailplane from coast to coast across the United States. Manifestly conditions would have to be such that uplifting currents or convection currents could be had over the deserts and prairies and winds of sufficient strength to give good convection currents over mountainous districts.

Probably one would have to fly for several days in different portions of the United States to gain the knowledge that the pilot should have to cover his route successfully during the long attempt.

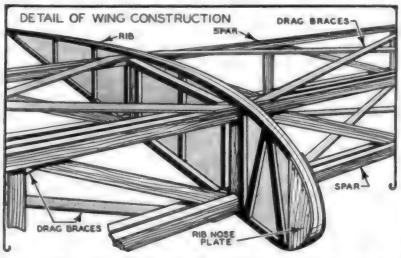
Several years ago we all supposed that it was impossible for power-driven aircraft to fly across the United States, yet it has been done without stop several times. I believe now it is possible for a sailplane to fly across the country. One has remained aloft 14 hours without propulsive power—a feat until recently thought *absolutely* and not relatively impossible—and the thought and care embodied in that flight would have only to be expanded to embrace the problems of a trans-continental sail.

Weather conditions react on a glider or sailplane in the same way they affect a power-driven plane. In an "up draft" the sailplane rises just as does an airplane, and the altitude limit a sailplane may achieve is reached only when convection currents no longer operate to push it on higher.

There is no theoretical altitude limit for a sailplane. It should be easily possible for a sailplane to go higher than the present record height of 2600 feet, providing the pilot could find convection currents at higher altitudes.

Few people thought when the Wright brothers installed an engine in one of their gliders and by that operation made an airplane of it that engineless air machines ever would achieve their present efficiency.

Yet well-designed sailplanes, confidence on the part of their operators and true ability to pilot them is opening a new field of sport.



Spars sized as shown, given in the article herewith, are made in the manner shown in this diagram. Mr. Bowlus also explains the simple method of making the paper-webbed, strong ribs.

One need little flying instruction to operate a sailplane. With a mild wind blowing the beginner enters the cockpit, settles himself and is slowly pulled into the wind. This may be accomplished by handpower or by an automobile.

Without endangering himself he moves the ailerons properly to keep the wings from touching the ground. He instinctively "uses the stick" correctly.

After testing his sense of balance in this way he soon

The Bowlus Glider Is Shown Below Ready for Towing to Take Off

Set to go! A towline (of rubber shock cord) is hooked to a car and at a speed of 22 m.p.h. this 308-lb. glider (fully loaded) soars aloft. Sailplanes have remained aloft 14 hours without power.

becomes ready for short hops of low altitude from level ground. Occasional crashes are inevitable. Yet the beginner need fear little physical injury because the glider weighs so little.

Once he has achieved sufficient experience a sailplane operator can achieve considerable altitudes. He must depend, of course, upon vertical air currents which will exert lifting forces on the flat surface of his wings.

To operate a sailplane most efficiently, a pilot must know the meteorology of these air currents. He soon will learn that currents sweeping along the ground and deflecting upward at the base of a hill follow the slope to its crest and slide down the other side.

By skillful maneuvering a pilot can keep his altitude over one spot, utilizing the vertical currents of the same wind area so long as the wind continues to blow.

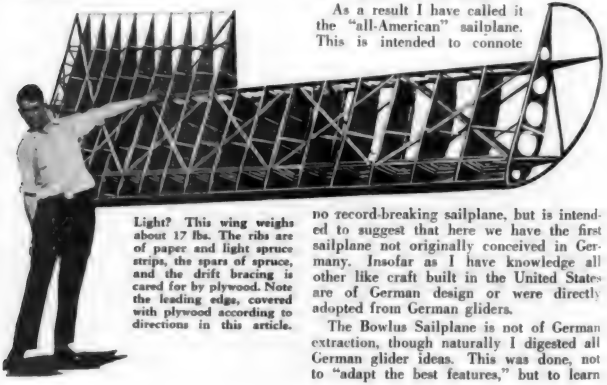
While the stresses and strains to which a glider is subjected do not approximate those experienced by an airplane during flight, yet one does not care to think from an altitude of 2,000 feet on the possibilities of structure' failure.

Superficiality in construction and operation might result in a serious accident.

There is no superficiality in the construction of the Bowlus Sailplane. The plane was carefully conceived, accurately engineered and its details of construction were the subject of much study.

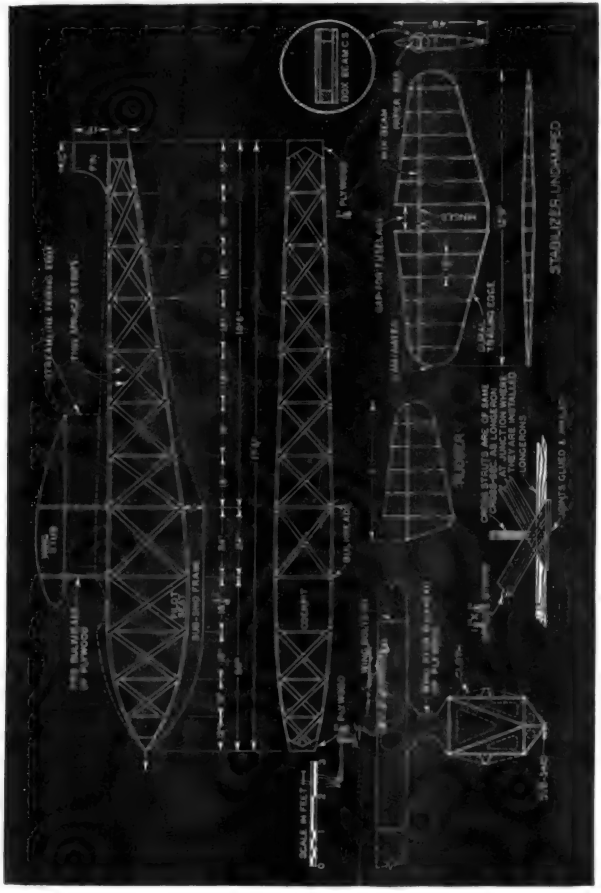
As a result I have called it the "all-American" sailplane. This is intended to connote no record-breaking sailplane, but is intended to suggest that here we have the first sailplane not originally conceived in Germany. Insofar as I have knowledge all other like craft built in the United States are of German design or were directly adopted from German gliders.

The Bowlus Sailplane is not of German extraction, though naturally I digested all German glider ideas. This was done, not to "adapt the best features," but to learn

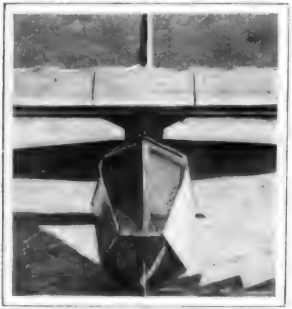


Light? This wing weighs about 17 lbs. The ribs are of paper and light spruce strips, the spars of spruce, and the drift bracing is cared for by plywood. Note the leading edge, covered with plywood according to directions in this article.

All-wood Fuselage Construction of Novel Glider Marks Simple Design



This Bow View Shows Cleanness



Good aerodynamic design is needed for performance in a sailplane. This shot shows how parasite resistance has been cut by good design.

as intimately as possible of glider progress, both of design and construction, in the parent country.

From that study I learned that a good sailplane must be possessed of three elements. In descending order of importance, these must be:

(1) good aerodynamic characteristics;
(2) structural strength and ruggedness;
(3) simplicity and ease of construction.

Manifestly the sailplane would not possess good aerodynamics if excessive drag were permitted. Accordingly I reduced drag to a minimum by streamlining wherever possible. Also for the same reason full cantilever type of construction was adopted.

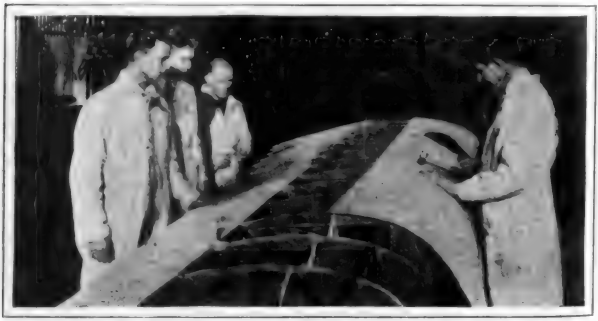
To achieve a sailplane of practical value we made it sufficiently rugged to stand considerable handling without the necessity of continually making minor repairs. This is as important in the sailplane as in the airplane field, for a sailplane to be popular must be both economical and strong.

The structural design was kept as simple as possible consistent with good performance and metal fittings especially were avoided. Wood members were used for bracing wherever possible.

The Bowlus plane is a high wing, full cantilever monoplane. It uses tapered wings. The fuselage is of rectangular cross section, tapering to a horizontal wedge in front and in the rear to a rectangular section about six inches vertical by ten inches horizontal.

The wings are made up in three parts, a center section of six-foot span being built integral with the fuselage and the two wings of nineteen-foot lengths bolted to this center section. Access to the mounting bolts is provided through hand holes in the fabric. This allows the wings to be demounted for transportation.

The fuselage has a maximum section at the pilot's seat of 24 inches deep by 19



Building a Bowlus sailplane wing. The paper webs in the wing ribs, the method of laying the thin plywood leading edge, and the drag bracing is clearly shown, achieving light weight strength.

The eight sided Bowlus sailplane fuselage presents a very clean appearance as it stands in the yard before the wings are mounted. Note the clips which retain the spars of the wings of the glider.

inches wide and is constructed of four spruce longerons ¾-in. by ¾-in. at the pilot's seat, and tapering to ⅜-in. by ⅜-in. at the stern plate and to ¼-in. by ¼-in. at the nose.

Strut members of the fuselage are also of spruce and have a cross section the same as that of the longerons at the station where they are installed. Diagonal bracing is taken care of by the use of thin spruce strips one and one-half inches wide by one-sixteenth-inch thick, good for a tensile load of approximately 500 pounds.

These strips are moistened and then glued and nailed in position with their center line intersecting the joint of the longeron and the strut. When these strips dry out they shrink slightly and give the entire structure rigidity without subjecting members to any great initial stress.

On each side a fairing strip one-quarter by three-eighths of an inch is placed on edge for the purpose of holding the cloth away from the sides of the fuselage. This also slightly improves the appearance. The forward portion of the fuselage, from the nose to the trailing edge of the wing, has a V-bottom and carries a skid for landing.

There is a bulkhead of three-sixteenths plywood immediately behind the pilot's seat. This extends from the keel up to the topchord of the front wing spar and at the rear wing spar there is a similar bulkhead.

These two bulkheads transmit the load of fuselage and pilot to the wings in flying, and to the skid on landing.

These bulkheads have an hour glass shape, being the full width of the fuselage where they attach to the longerons and above that narrowing to approximately the width of the pilot's head and again flaring out for their attachment to the wing spars.

Above the fuselage these bulkheads are boxed in, forming a stream lining for the pilot's head. The center section, which is attached to the bulkheads, is six feet long and has a chord of five feet, six inches. It is permanently attached to these bulkheads.

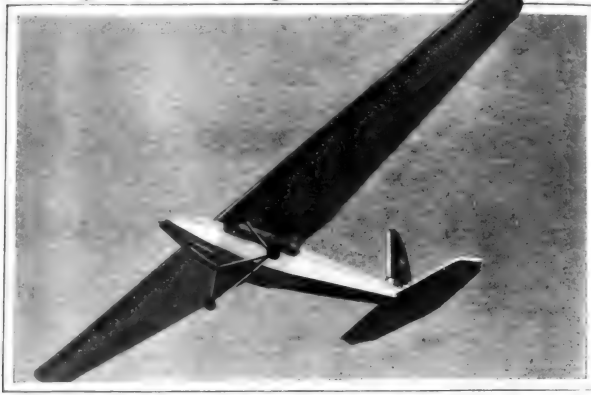
At the rear of the fuselage a short stub vertical fin is built, to which the rudder is attached. A light tail skid of conventional type, with rubber shock cord, is built in about a foot from the end of the fuselage, an inspection hole being provided by the use of hookless fasteners.

Conventional type controls using a stick and rudder pedals, operating the control surfaces by means of one-sixteenth control wire, are employed. This installation approximates that in some standard airplanes.

The wings have a span of 44 ft., with a chord at the root of 5 ft., 6 inches. They taper at the tips to 2 ft., 8 inches. The plane measures over all 25 feet.

Other vital figures are as follows: Weight empty, 160 lbs.; weight empty but with landing gear, 180 lbs.; aspect ratio approximately 11 pounds; wing curve, U. S. A. 35-A; wing area 179 sq. ft.; weight of separate wing panel, 31½ lbs.; rudder weight, 7 lbs.

In building the wings I adopted the U. S. A. 35-A airfoil because of its known efficiency. This wing gives high lift and is well suited to cantilever construction because of its deep section, the spars having



With a span of 44 feet, and a chord of slightly over 5 ft., the high aspect ratio of the Bowlus sailplane plus other good aerodynamic features have resulted in its becoming the officially recognized holder of the American gliding record, when it stayed up for 14 minutes and 33 seconds.

a depth at the root of 10.95 inches and 9.13 inches respectively.

The wings proper are 19 feet long and are bolted to the center section by duralumin fish plates. The spars are built-up Pratt trusses.

The top and bottom chords are made up of two strips of square spruce glued and nailed on each side of the vertical and diagonal members, the diagonal members, of course, being placed so as to be in tension under flying load.

The top chord of the spars is kept horizontal, the lower one slanting up. This gives a slight dihedral to the lower surface of the wing. The front spar is set at right angles to the center line of the fuselage, the rear one slanting forward in order to keep it as deep as practical, the taper-in plan form being obtained mostly by slanting the trailing edge forward.

Details of rib construction should prove of interest, for where the engine may be considered the heart of the airplane, the wing certainly is the "heart" of a sailplane. The wing must be efficient and, where full cantilever construction is employed, must be in itself very strong.

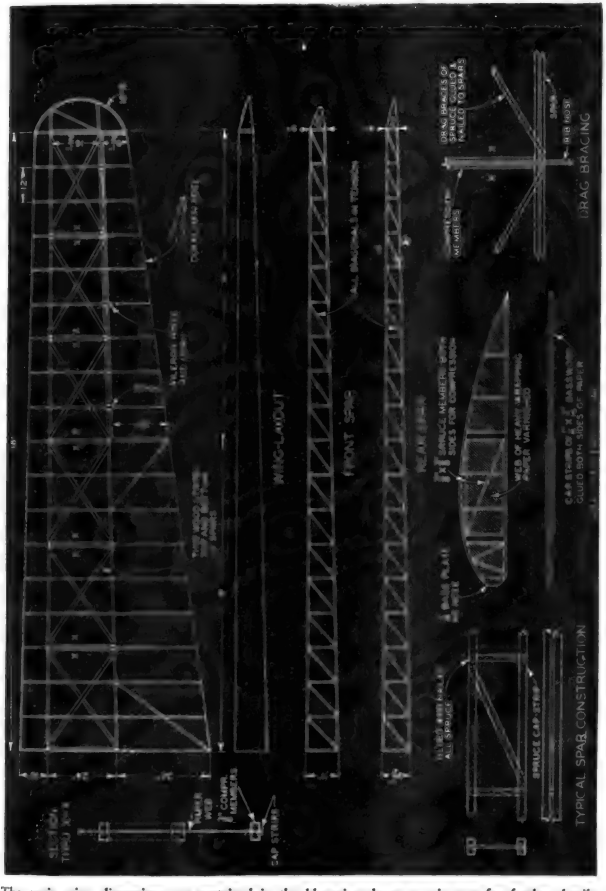
The heart of the wing is its ribs. In the Bowlus sailplane these are made by cutting a web of craft paper and gluing on each side of this cap strips one-eighth by one-sixteenth, nailed occasionally to hold them while the glue is drying. These ribs are found to be exceptionally light and very easy to construct and are many times stronger than necessary for glider loading. Every third rib is made a compression rib by placing spruce compression members on each side of the web.

The wings are braced diagonally in the same manner as is the fuselage, with thin spruce strips. The leading edge back as far as the front spar is covered with thin plywood to give a true airfoil section and to aid rigidity. A wire is used for the trailing edge.

These wings prove to be extremely strong and rigid, very little flexing being noticed even in flight. In fact the entire glider has been lifted by the wing tips.

Ailerons are 10 ft. long and have a box beam at their leading edge which is hinged at the top to the rear spar and are pulled up by the control cable and down by a spring, the greatest motion being upwards.

The Bowlus Glider Wing Tapered Cantilever in Plan and Form Shown



The main wing dimensions are contained in the blueprint above; see the text for further details.

We have used a balanced, full cantilever type rudder of rather thick section, the entire load being taken by a box spar placed one-third of the chord from the leading edge. The balancing fin is entirely cut away at the lower portion where the rudder is hinged to the stub fin.

The ribs of both the rudder and the elevator are constructed with paper webs the same as the wing ribs. The rudder is approximately five feet high and has a 33-in. maximum chord tapering to a rounded top.

We have employed a balanced elevator which is of the same section as the rudder and the ribs. Thus the stabilizer is equivalent to two rudders placed end to end.

We have continued the general streamline effect of the fuselage to the wheel section of the stabilizer which at that point is approximately the depth of the fuselage. Both stabilizer and rudder are attached to a 3/32 duralumin end plate from which ears have been bent out to form hinges.

For soaring flights the landing wheels may be removed and a keel skid installed for landing purposes. On the Bowlus sailplane the landing gear is constructed of duralumin tubing. Vertical struts extend from the wheels to the upper portion of the bulkheads and contain compression springs for absorbing shock.

We have found small airplane tail wheels, 10 inches by 3 inches, with straight side tires, serve admirably as part of the landing gear. Our wheels were made by turning a wood disc and gluing and screwing plywood plates on each side to hold the tire on.

It is understood, of course, that a quick release of conventional type is installed in the front end of the fuselage. This permits a tow rope to be dropped readily by the pilot when he is ready to cast off.

Surfaces of fuselage, wings and tail were covered with No. 100 cambric, which is light and takes dope well. I applied three coats of dope, the last one with aluminum pigment, in order to protect the fabric.

After the first experimental model was made we learned the sailplane was fairly easily constructed and performed better than had been anticipated. Normally it takes off at 22 miles an hour and its gross weight of 305 pounds has a gliding ratio of approximately 20 to 1.

With such machines as these, gliding can easily become popular because of the safety factor and ease of manipulation.

One Man Tends 400 Airplanes

These 1,672 parts of a Wasp airplane engine are ready for inspection.

HOW would you like to be responsible for keeping 400 airplanes airworthy during the year—when each of the engines of the ships has a total of 1672 parts? That is the regular work of Commander Karl Smith, assembly and repair officer for the aircraft squadrons of the Battle and Asiatic fleets of the United States navy. It is figured that Commander Smith inspects some 668,800 airplane motor parts annually. In the final analysis it is his responsibility to inspect these parts, recommend repairs, reject parts worn beyond repair, and detect parts which are weakening. Upon his organization depends the safety of the pilots and observers as well as the valuable government property involved.

Pine-Shoot Moth in Florida

THE European pine-shoot moth, first reported in the United States 15 years ago, has been discovered in Florida by Perkins Coville of the United States Forest Service. The insect was identified by August Busck, U. S. National Museum specialist on lepidoptera.

Up to this time the European pine-shoot moth has never been recorded south of Washington, D. C. It was first discovered in Long Island, and later spread to the Middle Atlantic States and through the New England States to southern Canada. In the North it seems to confine itself in general to the ornamental trees, and for that reason has not been a serious pest. In parts of Europe, however, it is very serious.

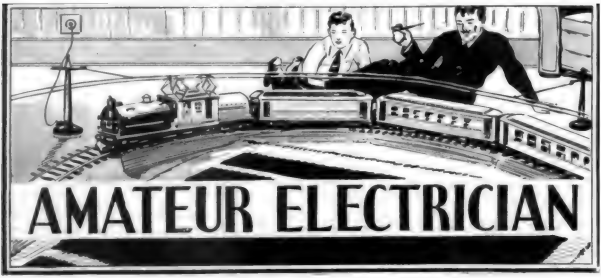
Type Is Now Being Set By Telegraphic Impulses

DEMONSTRATIONS in Rochester, N. Y., are reported to prove the value of the new teletypesetter machines that make it possible for telegraphic impulses to control and operate linotype and intertype machines. This is a practical extension of telegraphic operation of electric typewriters.

An inspector is shown holding the tape by which telegraphic impulses are carried to operate the newspaper linotype at his right, the message to be set having been telegraphed from a distance.

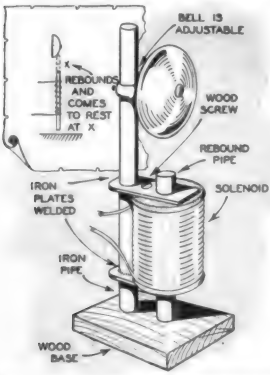
Above is a closeup of the newly invented Teletypesetter transmitting distributor equipped with tape reels. The upper reel holds the message which is sent from a distance, before the message has been set. The lower reel rewinds the transmitting tape for filing after the message has been automatically taken off and set in lines of type by the linotype.

An operator is shown above at the sending perforator and counter machine. Perforations in the tape passing through a device release electric impulses.



Edited by THEODORE ALLEN

This Single-Strike Gong Made From Pipe and Solenoid



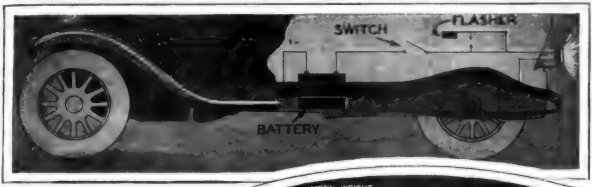
THERE are some signaling systems that require a single strike of the gong. For such requirements the following simple gong was worked out with splendid results:

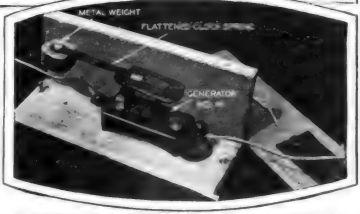
A piece of iron pipe has two pieces of flat iron welded on as shown in the illustration. Between these flat iron pieces the simple solenoid is fastened by means of wood screws which screw into the flange of the wooden spool. The hammer is another piece of iron pipe resting on a block of wood which forms one mounting bracket. Care must be taken to so place the lower block that the upper end of the hammer is just below the electrical center of the solenoid. The gong must be made adjustable along the pipe. This is done because when the hammer is drawn up into the coil the upper end of the hammer must strike the gong and rebound coming to rest a little below the gong. It should take no more than a few minutes to build this gong, and it is quite durable.—W. T. Claytor, Jr.

$50 IN PRIZE MONEY FOR AMATEUR ELECTRICIANS

Every garage in the country has dozens of old Ford spark coils kicking around the place doing nothing. These coils contain electric elements out of which innumerable useful articles can be made. For instance, in this department in a recent issue plans appeared for an ozone generator made out of such a coil. What can YOU build from a spark coil? For the best ideas, accompanied by diagrams and snapshots if possible, $50 in prize money is offered as follows: First prize, $25; second prize, $15; third prize, $10. Entries must be received by February 1st, 1930. In case of ties, duplicate prizes will be awarded. The editor of this department will be the judge and his decisions will be final. Address manuscripts to Modern Mechanics magazine, Robbinsdale, Minn., Spark Coil Contest Editor.

Automatic Auto Tail Light Flasher Gives Stop Warning





The tail-light flasher unit is shown above. Drawing at top of page illustrates the wiring hookup of flasher in the car.

AN automatic flasher which will increase greatly the effectiveness of an automobile "Stop" light can be made in an hour or two from materials easily and cheaply obtained.

The flasher operates by gravity, and will last the lifetime of the car. It consists essentially of a flat spring about 4 in. long with a weight on one end and an electrical make-and-break arrangement near the other. The end opposite the weight is fastened to a support so that the weight will be free to move up and down after motion has been started by the movement of the car.

An old generator relay, a length of clock spring, a lead weight, and miscellaneous screws and bolts are the materials needed. Examination of the relay will reveal that it consists of a flat piece of iron fastened to a support at one edge by springs, and bearing a contact point at the opposite edge. This piece moves in the field of an electromagnet. All of the wire should be removed from the coil. This consists of an outer winding of very heavy wire and an inner winding of extremely fine wire. The removal of the windings will leave an upright post bearing the spring-mounted iron piece, and another upright bearing a second contact point. Connections to the two terminals of the relay should be changed so that one terminal is attached to one contact point, and the other terminal to the second point.

The flat spring is formed from an old alarm-clock spring. It should be about ¼-in. wide and 4 in. long. Both ends are heated until the temper is removed for about ¼ in., and are drilled to take small bolts.

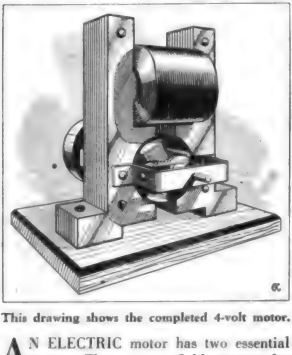
The weight should weigh from two to two and one-half ounces. It is attached to one end of the spring by means of the bolt. The spring with its weight is attached to the movable metal piece of the relay, with the weight and extending beyond the side bearing the contact points.

The flasher should be adjusted by bending the supporting springs so that the contact points just touch when the weight is at rest. If the weight is given a slight push it will move up and down for a considerable period of time, causing the contact points to touch each other and separate about one hundred times a minute.

The flasher is connected into the "Stop" light circuit in series with the switch and light. This is best done by disconnecting one of the switch terminals and connecting it to one terminal of the flasher. A wire is then run from the other flasher terminal to the free switch connection. The flasher should be encased in a suitable box, which may be placed under the seat to prevent injury to the mechanism.

The number of flashes per minute may be regulated by changing the length of the flat spring. A short spring will give a large number of flashes, and a long one a short number.

This Four-Volt Electric Motor Will Drive a Model Boat



This drawing shows the completed 4-volt motor.

In this fine article Mr. Allen, the department editor, presents plans for an efficient little electric motor which will drive a model boat two feet in length.

AN ELECTRIC motor has two essential parts. These are a field magnet for furnishing a strong magnetic field and a revolving armature. The field and the frame of this motor are laminated, that is, they are built up of sheet tin or ordinary stove pipe iron. Details of the field are shown in the drawings which accompany this article. Lay out one lamination very carefully as a pattern. Make certain that it is true to size and shape. Then use it as a pattern to lay out the ten pieces you will need. When squeezed together in a vise, you should have enough laminations to make a pile five-eighths of an inch thick.

The armature is made in the same way to the same thickness as the field. The armature is 1 3/16-inch in diameter, or 1/16-inch less that of the hole in the field in which it turns. The hole through the armature should be a scant eighth inch, through which an eighth inch shaft must be tightly driven. Rough edges should be cleaned up with a file and smoothed carefully so that the rotor will revolve freely in the field segments.

Armature Windings

The armature windings consist of four layers of No. 22 B&S gauge double cotton covered magnet wire wound around each arm. The armature should be insulated with several layers of shellacked paper before the iron wire is put around, and the sharp edges then cannot cut and give a short circuit. The winding should be in the same direction on each arm, and is connected to the commutator as shown in the blueprint.

The commutator is made of a piece of 7/16-inch steel copper tubing slipped over a block of fiber, retained with a ring after splitting with a hacksaw. Then the hole through the center can be drilled. See that it is large enough to drive over the shaft without splitting. The way the segments are located on the shaft in relation to the arms of the motor is shown on the drawing. The field winding consists of five layers of No. 18 B&S cotton covered wire. If fiber rounds are made to slip onto the ends of the windings a neater job will be made.

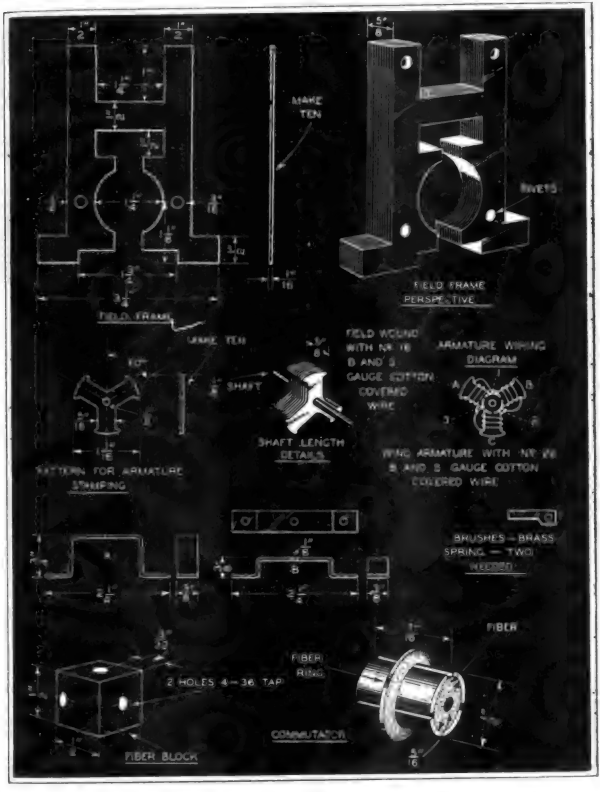
Bearings

Bearings are made of 3/16-inch brass strip one-sixteenth of an inch thick by bending and drilling. The location of the holes is best understood from the drawing. The larger bearing is assembled on the side toward the commutator. The bearings are mounted on the field frame by screws passing through the holes B-B into a nut on the outside of the bearing at the opposite side of the field. The armature should revolve freely and be equidistant from all parts of the field. End play is taken up by fiber washers at the ends of the armature.

The brushes are made of spring copper. They can be cut with a pair of snips. Each brush is mounted on a small fiber block supported on the large motor bearing. The holes marked A and B are used to fasten the block to the bearing. The brushes are fastened to the blocks by a 6/32 machine screw with a nut on the lower end.

The base is a rectangular block three inches wide, three inches thick and three-eighths of an inch wide. The motor is fastened to the frame with bolts passing through the feet of the field. One terminal of the field is led to a binding post, and the other to a binding post mounted at the base. The other terminal is connected to the right hand brush. The other lead from the bat-

Blueprint Shows Commutator, Armature, and Other Parts of the Motor



tery comes to the left hand brush, thus making the motor a series motor.

The motor if used to drive model boats is connected to the other shaft through a short length of spring. This makes a universal joint so the shaft can be run at an angle. The motor is now ready to run. Put a bit of light oil on each bearing and make certain that the curved portion of the brushes bears firmly against the center. The motor is three pole and will start without assistance. It will drive a model boat two feet long.

RAILROADING *in a*

J. N. Swartzell, superintending his basement railroad system which serves a model farm community.

ALTHOUGH his name doesn't appear on rosters of railroad officials, John N. Swartzell is president of a most unique transportation system with headquarters in his Washington basement.

The dwarf system represents a typical railroad junction in a rural section. It occupies 12 by 14 feet of floor space on tables with a tunnel to an adjoining room. The countryside is landscaped.

This business man's models are technically accurate in all details. His home workshop is equipped with the best electrified tools procurable. The bodies and boilers of his locomotive models are made from an aluminum casting—light in weight, easy to work and relatively inexpensive. Its drawback is that it can't be soldered. Brass is

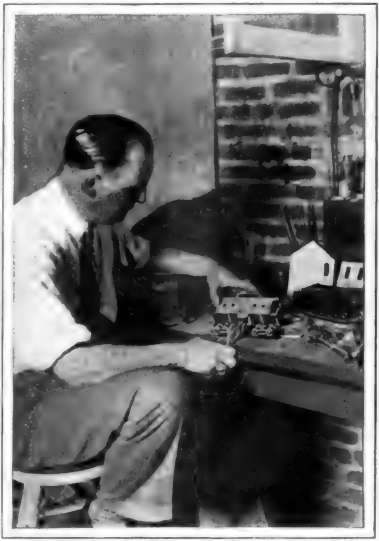
Reginald Claudius with his miniature of the world famous crack flier, the Twentieth Century Limited.

BASEMENT *with remarkable models of tracks and locomotives.*

used for wheels and trucks for electric locomotives. The drive wheels are fastened to small commercial motors installed in the aluminum castings. All the locomotives are balanced. Many amateur railroading models lack this desirable attribute.

The basement railroad has 500 feet of standard gauge track bedded on wooden crossties. The rails are brass and accurate simulations of those used on American trunklines. Even the frogs in the track are accurate in design and true to scale while the tiny switches are provided with automatic and hand controls.

The railroad is run from an electric generator actuated by a one-quarter horsepower motor with wiring for simultaneous east and west bound traffic as well as switching. This feature is outstanding as the average amateur provides for but one way service. Power is conveyed to the rolling stock by means of an electrified third rail, and a battery of 12 switches in a central switchbox controls the entire layout. Most of the coaches and freight cars are carved from white pine and painted to simulate regulation cars.



Mr. Swartzell working on a model of a caboose in his shop.

One of the accompanying photographs shows the basement railroad system. True to life models of the depot, coal pocket, power plant, water tank, round house, freight house, industrial plants and even a truss bridge are on display. Mr. Swartzell has even equipped his tiny trains with small models of standard coupling devices. Frames covered with muslin and coated with cement and plaster of paris form mountains and rolling terrain with model buildings for the district served by the road.

A home made model of a standard locomotive and tender, complete in all detail, which really runs.

Edited by A. NEELY HALL

Young craftsmen all over the country recognize A. Neely Hall as the foremost expert in his field. He is author of such well known books for handiworkers as "Carpentry and Mechanics for Boys," "The Boy Craftsman," "Big Book of Boys' Hobbies," etc.

This Reflectoscope Projects Pictures Without Glass Slides

HERE, you boy showmen! Add this lantern to your outfit, and you will have the makings of a performance that will hold the attention of your audience until time for the next show.

This lantern light does not project through pictures, but reflects. Your slides are not transparent like the glass slides for a stereopticon, but are opaque. Any printed picture or photograph print, in black and white, or in colors, may be thrown upon the screen, and colored pictures will be in their natural colors. What an opportunity to make slides!

Start your slide collection by getting together the greatest assortment of pictures of airplanes and airships that you can find. Clip newspaper supplements, magazines, and catalogs of airplane manufacturers, but select only pictures that are clear. Possibly you know as much about ships as the next fellow, but when you have clipped, mounted and arranged several hundred pictures, you will know a heap more than you know now, and you ought to be able to explain to your audiences much that is new to them, because the average person knows little about aeronautics. Supplement your ship pictures and ship "talkies" with pictures and descriptions of airplane engines, and details of parts of planes.

Instructive as well as entertaining are the pictures which can be projected on a screen by a home-made reflectoscope.

Figure 2 shows a front view of the home-made reflectoscope, Fig. 3 a plan, Fig. 4 a rear view and Fig. 5 a cross section. The lantern house requires a box about 9 inches wide, 16 inches long and 9 inches high. If you cannot get a box at a grocery or paint store, make one of box boards. If you can get a box with sides in one piece, or of matched boards, it will make a light-tight lantern.

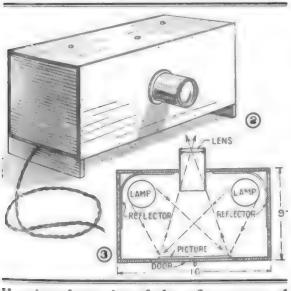
Let the top of the box be the lantern back. Cut three boards to fit it. Nail two of them

in place, and hinge the third between them for a door (Figs. 5 and 6). Screw a spool or screweye into the door at the top for a knob, and an iron button or cupboard catch at the side, to fasten the door when it is closed. Cut two grooved strips like those in Fig. 7, and tack them to the inside of the door to form a frame to slide pictures into.

The better lens you have, the better the screen pictures will be. The lens of regular reflecting-lantern equipment can be purchased through any dealer in optical goods. The size recommended for best results is of 2-5/16 inches diameter and 10 inches focus, but the smaller size of 1⅝ inches diameter will answer the purpose if the light is strong. The lens is mounted in a heavy brass tube with rack and pinion focusing adjustment. It is designed to give the maximum illumination and a flat field.

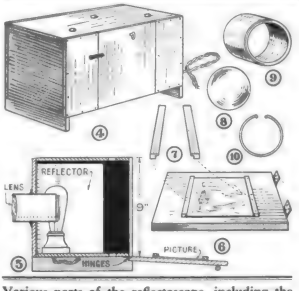
If you cannot buy one of these lantern lenses, any double-convex type of lens about 3 inches in diameter will give fair results, with strong lighting. A bicycle lamp lens, a reading-glass lens, or a magic-lantern lens will serve the purpose. Figure 8 shows such a lens without mounting. Make a tube of a tin can of the right diameter to support the lens. Remove the can bottom. Make a wire ring like that in Fig. 10, and slip it inside of the can to hold the lens close to the can rim.

The diagrams show how to mount the tube in the lantern. Cut the opening just large enough so the tube will make a slip fit. Tack a fruit-jar rubber to the box, around the opening, to prevent any light rays from leaking out.



Here is a front view of the reflectoscope and drawing showing picture in relation to the lens.

Projector Shows Pictures Clearly



Various parts of the reflectoscope, including the frame, slide holder, and lens with tin can barrel are shown in the above drawing.

Install an electric lamp in each of the two front corners of the lantern, to make even illumination. Buy a pair of wall sockets, and screw them to the lantern bottom, at equal distances from front and ends (Fig. 3). Connect a drop-cord to them, and an attachment plug to the drop cord. The lamp and lens centers should be at the same height. If necessary, block up the receptacle bases. Use 60-watt or larger mazda lamps for illumination. Results can be improved, if the lens is not good, by the use of stronger illumination.

Shape a pair of reflectors out of bright tin, and fasten them in the box corners back of the lamps, as shown in Fig. 3.

Nail two strips of wood to the lantern bottom to raise it about 1½ inches. Bore several holes through the lantern top and bottom for vents. The top holes can be shielded with tin, to prevent emitted light from interfering with the projection light.

Paint the inside of the lantern dead black, to eliminate all reflecting surfaces except those of lamp reflectors and picture. Putty joints that are not light-tight. Give the outside surfaces two coats of paint.

You need not mount your pictures. If any are too small to fit in the picture holder, clip them with paper clips to cards of the right size to fit the slides of the picture holder.

Classify your pictures. A good arrangement is to buy a package of large envelopes,

and letter them from A to Z, or in some other way, so that you can find what you want when you want it. When your picture collection has grown large, make a file in which to keep the envelope containers.

A silver screen like those used for moving pictures is best for reflected opaque pictures. Make one of a sheet of wallboard. Coat the wallboard with shellac. Then apply a coat of varnish, and while the varnish is wet, sprinkle aluminum powder upon it. When the varnish has dried, brush off the surplus powder.

An Electric Lighted Star for The Christmas Window

WHEN you have prepared the mold for casting the Christmas star shown in Fig. 1, you can make any number of castings with little work. Make up several of them for relatives and friends while you are casting.

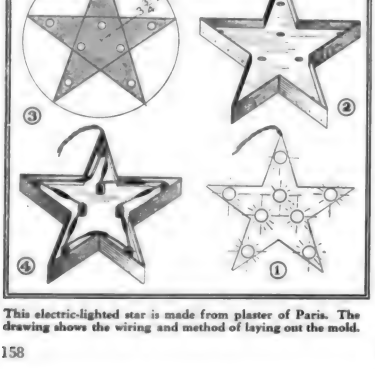
Fig. 2 shows the form required. You can make it any size you want, but a star 7 inches across points is a good size for tree or window. Fig. 3 shows how to lay out a star of this dimension. Describe a circle with a radius of $3\frac{3}{4}$ inches, divide it into five equal parts, using trial measurements until you find the exact divisor, and connect opposite points with straight lines. Then locate centers for eight socket holes. Transfer the star outline upon a piece of board, saw out the piece, and at the socket centers bore holes $\frac{1}{4}$ inch deep of the exact diameter of the miniature sockets to be used in the star. The sawed block will look like the base of the form in Fig. 2.

For the edge of the form, get a strip of galvanized iron $1\frac{1}{2}$ inches wide and 28 inches long, and shape it to fit around the edges of the base as shown in Fig. 2. Make sharp bends, using a hammer or pliers to assist you in bending. When you have shaped the strip, tack it to the edges of the board base.

Next, wire the form as shown in Fig. 4. Stick eight miniature sockets into the holes in the form, connect them in series, same as tree lights are wired, and tape up the connections with rubber and friction tape. Run the wire terminals through the top point of the star, and connect to an attachment plug.

When the wiring is complete, grease the surfaces of the form with automobile grease. Then mix plaster of Paris with water, and pour it into the mold. Be careful to run it close to the sides of the mold, and around the sockets. Mix a small batch of plaster at a time, as it sets quickly. Fill the mold even with the rim. Allow the casting to set for a day before removing it from the form. Then it will be thoroughly dry and there will be little danger of its not coming out clean. When you have removed the casting, fill out imperfections with fresh plaster of Paris.

Shellac the casting, then bronze it or apply radiator aluminum paint.



This electric-lighted star is made from plaster of Paris. The drawing shows the wiring and method of laying out the mold.

Small Gifts in Wood

NOW that Christmas is just around the corner, the young man with a home workshop will find it a handy answer to the gift problem. Innumerable items can be made from wood which will make satisfactory gifts. A few of them are listed below, and your own ingenuity will think of a hundred others: Necktie or towel rack, match holder tray, book ends, pen rack, candle stick, stationery rack, etc.

Lighted Base Solves Problem of Christmas Tree Holder

THE photograph shows a Christmas tree base which will end the last minute scramble to knock together a support preparatory to trimming the tree.

Fig. 1 shows a plan of the base top, Fig. 2 a plan of the bottom, and Fig. 3 a cross-section. The framework is built of four pieces of 2-by-4s, 32 inches long, notched as shown in Fig. 4, to make halved joints. Saw the sides of the notches and split out the wood between the saw cuts with a chisel.

Miter one corner of the 2-by-4 ends. By a miter is meant a cut of 45 degrees.

The edge of the base is of 1-by-4 boards. First, nail every other board in place. Trim off their ends flush with the 2-by-4 ends. Then nail the intermediate boards in place, and trim off their ends flush with the faces of the first boards.

Now for the tree socket. Buy a 3-inch pipe flange union (only one-half is needed), and a 3-inch nipple 8 or 10 inches long. Cut a piece of 10-inch board to fit in the center square of the frame, and fasten it to the 2-by-4s even with their bottom edges (Fig. 3). Bolt the flange to this board so that it centers on the base, and screw the pipe nipple into it (Fig. 3).

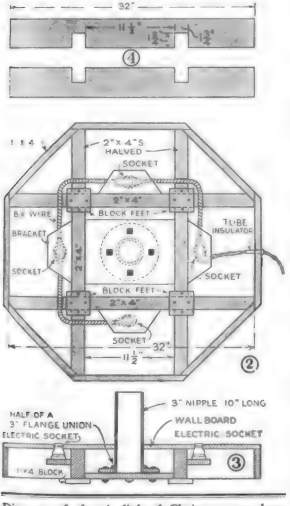
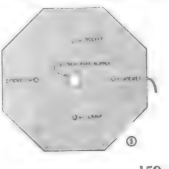
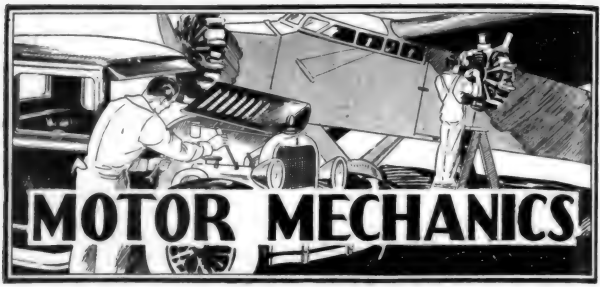


Diagram of electric lighted Christmas tree base.

Next, wire the base. Cut four wooden brackets of the shape and size indicated in Fig. 2, and nail them to the 2-by-4s outside of the center square, 1½ inches below the tops of the 2-by-4s. Locate the centers for the lamp receptacles, screw these to the brackets, and then proceed with the wiring. Fig. 2 shows the use of BX wire, let into notches cut in the edges of the 2-by-4s. If you use this, remove the metal insulation at the sockets, and make connections with the socket binding posts. Remove the metal insulation also at the point of entering the base, and run the wires through a porcelain tube. Tape the connections. When you have completed the wiring, attach a plug to the wire ends, screw a lamp into each socket, and test out.





Edited by RAY F. KUNS

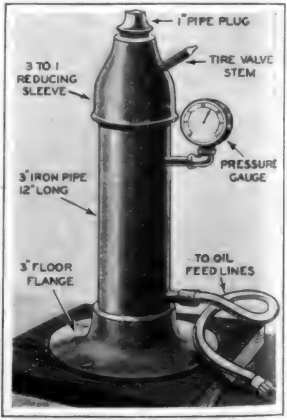
The wide experience of Mr. Kuns in the automotive industry qualifies him admirably as editor of this department of Modern Mechanics magazine. He is principal of the Cincinnati Auto Trade School, editor of the Automobile Digest, and author of "Automotive Electrical Practice," "Automotive Trade Training," etc.

Simple Home-Made Device Tests Bearings for Clearance

JUST how tight should a bearing job be set up? Of course every one knows that if one bearing is loose the oil will escape and starve the bearings which are tight. The simplest way to actually prove the results of a job of refitting new bearings is to make use of a device such as that shown in the illustration. This is nothing more than a short length of iron pipe which has a flange on one end and a reducing sleeve on the other end. A gauge is provided to show the pressure registered when air is forced into the plugged container through the tube stem air valve screwed into a 1/8" pipe tapped hole in the reducer.

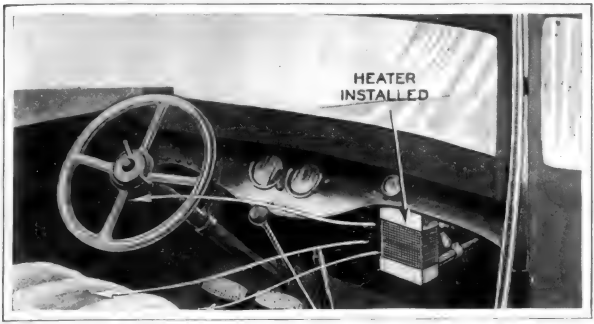
At the bottom of the pipe length another 1/8" hole is tapped to receive a brass tubing fitting. This fitting has a length of copper tubing run from it to the oil lines of the lubricating system of the engine so that the oil may be forced under pressure to the oil lines of the engine.

The normal oil pressure for the car being serviced is placed on the oil in the reservoir by running air from the foot pump or air lines into the device. This forces the oil into the engine lines and then it will find its way into the bearings and start to drip from them. If all bearings are equal the number of drops per second will be approximately equal. If some are loose they will drain oil much more rapidly than the others. A normal flow is 12 drops per minute.



This bearing tester can be made in any shop.

Make and Install This Hot Water Heater in Your Auto



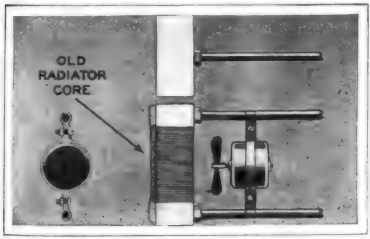
Installed under the dashboard, this home-made hot water heater keeps the inside of the car warm.

ANYONE desiring a practical heater for a car, utilizing the hot water from the engine block in place of the exhaust or hot air from the manifold, will find that one can be made with the use of only a few tools and a little patience.

Secure from some auto radiator repair concern a radiator core measuring six inches in height and seven inches in width. Have a small copper tank, 2" high, soldered to the top and bottom of this core. In the center of these tanks, on the back side, solder bushings to fit a ½" pipe.

When this is done, be sure to have the tanks and core tested for all leaks, as this part of the heater must be watertight.

Now take two pieces of standard ½" pipe 10" long and thread one end of each back about 1½". Thread the other ends of each back about 3½" to 4". Screw these pipes into the tanks with the long threaded ends out. The heating unit now completed, the next step is to attach a motor and fan to create a draft. Any six-volt battery motor can be used, but it is advisable to get one with heavy bearings. A motor from an old horn is very satisfactory if it is not too large or does not draw too many amperes. The motor is now to be hung in the center between the two projecting pipes. This can be done in various ways. The simplest possible is to take a ¾" brass strip, bend it over the top pipe, down over the side of the motor, around the bottom pipe and up over the side of the motor to a point about an inch below the upper pipe, as shown in diagram. Right above and below the motor, drill a hole through this strip that will take an ordinary stove bolt. Now, by placing the motor in position and tightening up these bolts the motor will be held in place.



This shows how radiator, water pipes and fan are assembled.

To the motor shaft attach a 5 or 6" four-bladed fan. Move

the motor so that the fan will be about an inch from the radiator. Adjust the fan blades now so that they will create a small draft with the least load on the motor.

Ground one side of the motor and to the other binding post attach a rather heavily insulated wire. The heater now is ready to be installed.

Drill two holes through the right hand side of the cowl well up underneath the dashboard so that the pipe from the heater will pass through easily.

Next get four flat pipe nuts; put one on each pipe and thread back about three inches. Next to these slip on an iron washer at least two inches in diameter. Now place the heater in position and on the front side of the cowl slip on a washer on each pipe as before, as well as another flat nut.

Draw up on these two nuts until heater is rigid! Rubber tubing is now slipped on each one of these pipes and held in position by ordinary garden hose clamps. The hose from the upper pipe is now connected to the upper radiator hose. The lower one is connected to the lower radiator hose. This can be done in various manners, but it is advisable to have a mechanic do the job.

Connect the wire from the motor to a small tumble switch preferably located on the dashboard, and from there to the battery side of the ignition bus board, usually located on the side back of the dash.

This heater if used with a shutter in extremely cold weather will usually produce more than enough heat as well as cause a good circulation of air in the car which helps prevent frosting of windows. —Roland Andrews Fletcher.

Checking the Car for Winter

IN PREPARING the car for winter driving, there are a number of items which the careful driver will inspect. First of all there is the need for changing the crankcase oil to a lighter grade, as well as the grease in the transmission and differential. Inspect the cooling system to make sure there are no leaks in radiator or hose connections which might result in waste of the anti-freeze solution. Have the brakes adjusted so that each wheel takes hold evenly; this will go far toward preventing skidding on slippery streets.

Hints on Focusing Headlights

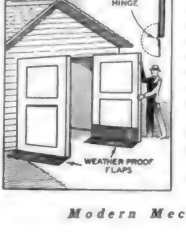
NO BEAM from the headlights should rise above a line drawn parallel with the roadway and even with the top of the beam at the point at which it emerges from the head-lamp lens.

Most head lamps are adjustable so that they may be tilted down to overcome a high beam. Before doing this, focus the head lamps and get the best possible light patterns as reflected on the garage doors, or other wall.

Remember also that both head lamps should be in line with each other. Test them as shown in the drawing above. If each edge of each rim touches the straight edge and the lamps are locked in that position the best possible road lighting will be secured.

Flaps Make Weatherproof Garage

THE home garage can be made snug for winter weather by attaching weather-proof flaps to the bottoms of the doors as shown in the drawing. They can be made of fabric or heavy building paper, and will serve to retain overnight in the garage a portion of the heat thrown off by an auto engine after it has been driven.



Cycle Engine Runs Baby Car

The tiny air-cooled motor of the baby car designed by James V. Martin to sell at $200 is shown above. Its four cylinders are of the type used in driving motorcycles, but a special crankcase and transmission are used. The piston displacement is only 45 cubic inches. At the right the lightness of the car, which weighs only 600 pounds, is demonstrated in the ease with which the man lifts the rear quarter off the ground. The car makes 50 miles on a gal. of gas and seats three people.

FURTHER details of construction of the $200 "baby" automobile, described in the November issue of MODERN MECHANICS, have been made public by James V. Martin, designer of the car. Important features of the tiny car are the absence of chassis and axles, made possible by the attachment of the wheels directly to the body by means of airplane rubber shock cord, and the use of a four-cylinder air-cooled engine of the type used to drive motorcycles, converted to auto use.

Only four units are used in constructing the little car. The first unit is the body, which has a reinforced lower portion to which the wheels, the second unit, are attached. Each wheel is mounted on a bracket which has a slot that permits free up and down motion. Shocks encountered by one wheel are thus not transmitted to the other wheels through connecting axles.

The power plant is the third unit, including a starter. Four bolts secure it to the body. Piston displacement of the engine is only 45 cubic inches as compared to 201 cubic inches in a Ford motor. A steering gear of the same type used in larger cars is the fourth and last unit of construction.

A short drive shaft runs directly from the transmission to a housing containing the worm drive and differential, which is mounted between the rear wheels as in the conventional automobile, but secured to the body.

The method of mounting wheels individually is shown above. Rubber shock cord absorbs blows, the wheel being free to move up and down.

Honey in Water Is a New Efficient Anti-freeze Solution

Honey in water prevents freezing or boiling.

A STRAY honeybee in your motor car may provoke an accident but strained honey in your radiator as an efficient anti-freeze agency when winter comes, engenders driving satisfaction. Science has determined that honey not only is a preventive of freezing but it also has ascertained that this sweet possesses the antipodal ability to restrict boiling. Thus, strange to say, the material which you can use during the winter as protection against cold damage may be harnessed during the peak of summer heat and humidity in the mountain regions to prevent the water in your radiator from boiling away and disappearing as steam.

Research in the possibilities of honey harnessed as the newest assistant of mechanics, manufacturing and industry is as yet a mere infant in arms. Science has done nothing more than to scratch the surface of this potential field of honey utilization. In some factories, honey has already been substituted for glycerine in the manufacture of gaskets. The facts that honey has a higher boiling point than water while it does not evaporate and will not freeze qualify it admirably for many other unique uses in the arts, science and industry. Only the future will demonstrate the important purposes — now unsuspected — to which honey may be put.

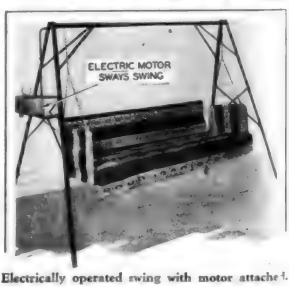
One critical objection to some anti-freeze solutions for use in motor car radiators during cold weather is that they evaporate and have to be replenished frequently.

Alcohol Turns Autumn Leaves Red

LEAVES turn red in autumn from the same cause that turns noses red at any time—alcohol. Such is the declaration of Samuel G. Hibben, lighting specialist of the Westinghouse Lamp Company, who has studied the effect of sunlight on living things.

Electric Motor Is Adjusted to Automatically Sway Swings or a Buggy

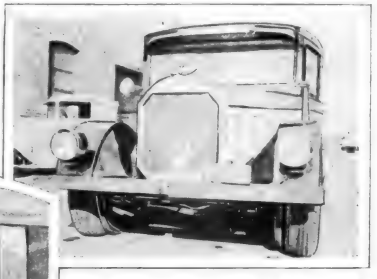
AN ELECTRICALLY operated swing is now available for the lazy man, the invalid or the comfort seeker. The electric swing is for use in hospitals, sanitariums, at beaches, in hotel lounging rooms and lawns, residences and yards. There are no switches to turn on or off. The occupant simply sits down and starts the swing with his toe on the floor and continues swinging until stopped by placing the foot on the floor. There is a little lever by which the distance the swing travels may be adjusted from a small movement to a big full swinging motion. The swing, slung in a frame, is moved by the power of a small electric motor. The frame is so arranged that a baby buggy or invalid's chair can be attached.



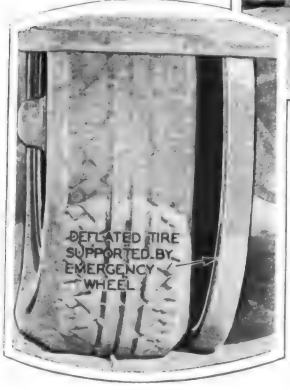
Electrically operated swing with motor attached.

Emergency Wheel Goes to Work When Tire Is Deflated

A CALIFORNIA motor - bus line has adopted a recently patented emergency wheel which reduces tire wear and accident hazard. The spare is a sturdy steel disk wheel with small solid tire of a smaller diameter than the regular balloons. The disk is attached to the running wheels on the inside using the same bolts as secure the former. Installation is simple. When the running tire is gradually or abruptly deflated, the emergency wheel carries the load until the bus is stopped thus preventing breakage of the tire sidewalls and lessening danger of lost control in case of a blowout at high speed. Results of tests showed the emergency wheels to be satisfactory in actual service.



Above the emergency wheels are shown off the road as tires are inflated and giving support.



The rigid emergency wheel supports the bus which settled as the regular tire was deflated.

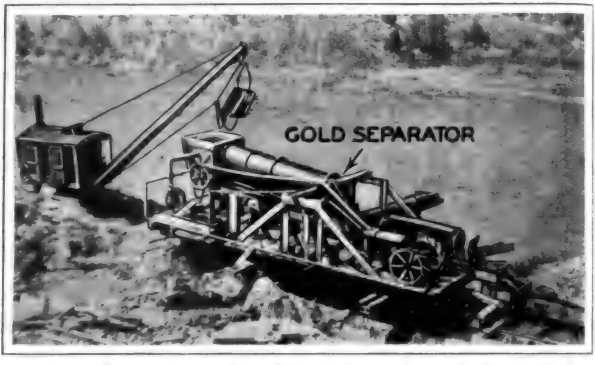
Typewriter for Musicians

COMPOSITION of music on a typewriter, often called an impossibility both by musicians and experts on mechanics, is reported to have been accomplished by Signor Andrea Ferretto, an Italian musician and mechanician. Written music is the most complex of all equivalents of language having 90 or 100 notes, each of distinct pitch, which can be played on some instrument. These notes must be placed properly on the musical staff and each indicate its proper length of time. Notes must be linked in phrases and expression marks added and there are other difficulties. Ferretto's device resembles a typewriter.

How Fish Changes Its Color

HOW a flounder uses the upper and lower halves of his eyes separately to make sure that his back is the right color for the bottom on which he lies is shown by recent experiments of Dr. Francis B. Sumner and Ancel B. Keys at the Scripps Institute of Oceanography at San Diego, California. As a flat, sluggish fish, spending much time creeping slowly along the sea bottom for food, the flounder is likely to be pounced upon suddenly by enemies from above. To help escape this fate the flounders have acquired ability to turn darker or lighter in color to suit the bottom on which they happen to be. The experimenters used a tank and light arrangement to learn the flounder's secret. The fish's signal for a color change is they found, a change in the ratio between the light coming from above and which enters the lower halves of the fish's eyes and that reflected from the sea bottom into the upper halves of the eyes.

GOLD EASY to GET



A complete gold dredge and separator sifting Colorado river sands shown in photograph above.

Surprisingly simple device takes flour gold from sand and refuse of worked mines. The sand is sifted and placed in centrifugal bowls with riffled bottoms which catch the gold overlooked by earlier miners.

By JAMES LOWELL

GOLD! That magic word has taken men to the ends of the earth, peopled wildernesses, built cities and caused strife between nations, but though very few persons possess it in any great amount, except, of course, in their teeth, it isn't so hard to obtain if you just know how.

As witness to the fact two men, C. E. Gish and T. W. Ainlay, of Farnam, Nebraska, have perfected a surprisingly simple device which separates "flour" gold from the sand along river beds and the "tailings" which are piled high around the mouth of every gold mine, working exactly on the same principle as is employed in the common cream separator.

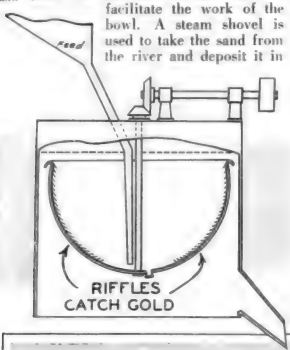
Men have labored for half a century to perfect a device which would separate flour gold from worked-over ore and gold-bearing sand. A Wichita, Kansas, man spent $100,000 trying unsuccessfully to make such a machine. Several devices, very inefficient however, have been produced; but it remained for two citizens of the "cornhusker" state to finally devise a perfect separator, or near enough perfect to get one-fifth of one per cent of the gold. Possibilities of the perfected gold-separator can be seen when one stops to reflect that from 25 to 30 per cent of the gold originally contained in the ore at the mines is dumped into the waste pile, the gold being lost in the process of sluicing.

Working in Mr. Gish's garage at Farnam, the two Nebraska men finally hit upon a solution to the problem that had bothered earlier inventors. The old separators had been cylindrical in form; the Nebraskans conceived the idea of making their separator bowl-shape and lining it with corrugations, back-set at a different angle, to follow the curvature of the bowl. The result was that sand and dirt rose to the top of the rapidly revolving bowl and were thrown

IF You Know How

out while the gold flakes were caught by the riffles in the bowl and settled to the bottom where the gold could be taken out in pure enough condition to be sent direct to the mint without further refining.

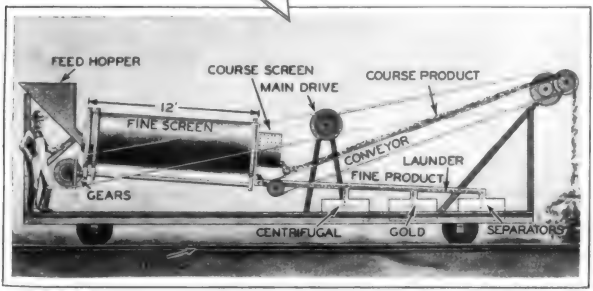
Joseph Bjorn, of McCoy, Colorado, who has had experience in gold mining in the Colorado camps, Alaska and California, has now taken charge of the Ainlay-Gish separator and is using it to take flour gold from the sands of the Colorado river in Colorado and Utah. He has devised accessories to facilitate the work of the bowl. A steam shovel is used to take the sand from the river and deposit it in a hopper. Two cylindrical screens, a coarse one within a finer, receive the dirt from the hopper, and the twice-screened gravel is conveyed to the separator bowl. A 30-ft. elevator carries off the residue and another removes the last tailings. Water is necessary, of course, to the operation of the machine.



The entire unit, excepting the steam shovel, is mounted on a truck similar to a railroad flat-car and by laying rails along ahead can be moved as the work progresses. Each unit costs about $30,000. The machines will be placed along the Colorado river, as well as at the gold mines, as soon as they can be financed and built.

There are six bowls with every unit and the spinning bowls can be stopped and emptied at any time. Usually a bowl is cleaned out every six hours. If permitted to run three days the gold deposited at the bottom of the bowl will be worth about $3,000. Seven hundred yards of sand are handled in one day by a unit and the cost of operation is twelve cents a yard. The machine has the endorsement of such men as Charles W. Henderson, United States Bureau of Mines, and John T. Joyce, commissioner of mines for Colorado.

Sands available for the working by the new separator will produce up to $8,700 a ton, according to Mr. Bjorn.

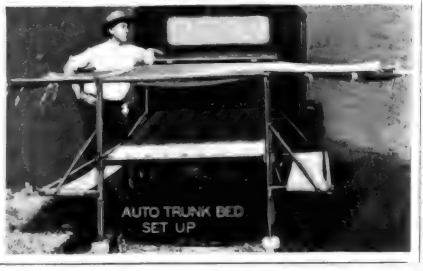


At the top is sketched the centrifugal bowl which separates sand and dirt from flour gold and below is shown the complete separator unit which makes mining easy. Man shows size of machine.

Unique Portable Bed Rolls Back Into Automobile Trunk

THE latest in compact camping equipment for the touring motorist is a steel trunk which can be carried on the side or back of any automobile and opened at camp to divulge a rolled up bed, spring and braces. It weighs 100 pounds and carries a mattress, four blankets, two pillows and spring. The bed can be made up for use in three minutes according to G. A. Mayer, the California inventor. All of the frame parts are of the knock down variety and stow in the bottom of the trunk while the spring, mattress and bedding are rolled back into the trunk. The roller is operated with a detachable crank.

G. A. Mayer is shown above with the portable bed he has invented. The bed trunk equipment weighs but 100 pounds. It is 44 inches wide, 27 inches high and 12 inches thick. The spring mattress is arranged on a roller turned by a detachable crank. The frame work for the bed is stowed in the bottom of the trunk when not in use. The trunk can be fastened to the rear or side of any automobile.



The new portable bed drawn out of its trunk and set up for use.

New Anesthetic Removes Fear

A NEW anesthetic which puts patients to sleep so pleasantly and easily that they ask for more, has been reported by Dr. J. S. Lundy of the Mayo Clinic and Dr. R. M. Isenberger, professor of pharmacology of the University of Kansas. Fewer unpleasant after-effects and far less danger than many of the local anesthetics are claimed for this new aid to surgery, which has the impressive name of iso-amylethyl barbituric acid and it is reputed to reduce the fear of anesthetics suffered by some people. The work grew out of the old problem of how to offset the bad effects of some local anesthetics. Drs. Isenberger and Lundy found that certain substitution products of barbituric acid gave protection against convulsions from procaine.

Try to Measure Tiny Organism

AN ATTEMPT to measure the world's tiniest living organism has been made by two St. Louis scientists, Drs. D. M. Heller and Jacques Bronfenbrenner of the Washington University School of Medicine. This organism is the bacteriophage, potent destroyer of bacteria. It is so small that it cannot be seen even with the aid of the most powerful microscope known to modern science. The radius of the average size particle of the phage is approximately one four-millionth of an inch, the two scientists calculated. Even this infinitesimal particle may not be the smallest unit of the phage but may serve as a carrier for still smaller ones. The germ of typhoid fever, which can be seen under the microscope, is about six times as large.

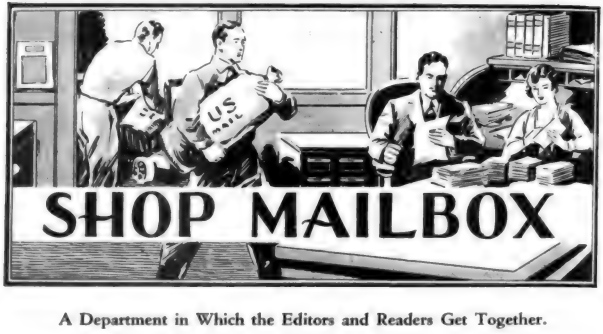
Rocket Planes May Circle WORLD

Here is an actual photograph of Fritz Von Opel making the first successful flight in a baby airplane propelled a mile a minute by rockets.

FRITZ VON OPEL, who recently made a sensational flight of a mile and a quarter in a minute and a quarter at an altitude of about 25 yards in his rocket propelled airplane is confident his pioneer work will result in round-the-world rocket flights. "When we are able to make full use of this gas (escaping from the rocket nozzles) we shall be able to fly around the world in under five hours," Opel said immediately after his flight. "I know that time will come." The rocket ship is a combination of glider and baby plane weighing 250 pounds. The ship, with pilot and rockets, weighed 500 pounds for its trial flight. Three rockets launched the ship from its railed runway and it was then propelled by the pilot firing other rockets. Opel and his fellow rocket expert, Friedrich Wilhelm Sanders, expect to develop the principle to demonstrate its uses in starting airplanes and acting as a brake. Recently on the Elbe near Dessau a Junkers airplane was started for the first time by the aid of rockets. A big freight plane moved on the river with throttled motor. Suddenly the rocket explosions set off by electrical contact started the plane as if it were being shot from a great gun.

Sixteen powder rockets, each eighteen inches long and three inches in diameter are shown being placed in the carrier on Opel's rocket plane for the start of his sensational flight. Three 10-pound rockets were exploded to launch the ship and others exploded during the flight.

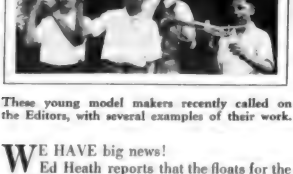
This is the take-off of Opel's flight, the exploding rockets sending back clouds of flame and smoke in launching the ship from its railed runway.



SHOP MAILBOX

A Department in Which the Editors and Readers Get Together.

FRIENDS of MODERN MECHANICS are frequently calling at the editorial offices in Robbinsdale. The other day Lawrence Leith, Henry Wales and Robert Bond paid us a visit with some of their fine models. Weston Farmer, Associate Editor and Leon Pilon, Circulation Manager, were given the opportunity to fly some of the models these lads have made in their shop at 2322 Bryant Ave. So., Minneapolis. See the picture below. These enthusiastic model plane builders say they will be glad to hear from others interested in the making of model airplanes.



These young model makers recently called on the Editors, with several examples of their work.

WE HAVE big news!

Ed Heath reports that the floats for the Super Parasol, substantially as published in the 1930 FLYING MANUAL, but considerably simplified for amateur construction, work like a charm. We publish a shot of the plane on the water this month and shortly will furnish plans in a how-to-build article by Stewart Rouse.

Here's an excerpt from Ed's letter:

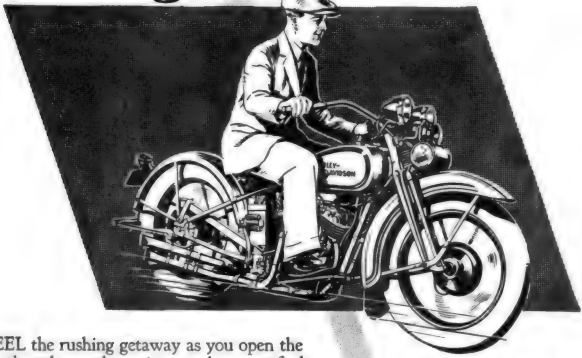
We have recently equipped one of our Standard Super Parasols with a set of specially constructed pontoons so that the plane may be flown off the water with our regular Heath-Henderson motor. This machine equipped as a sea plane weighs complete 340 lbs. dry. We believe this is the smallest and lightest sea plane that has ever been constructed. We have been very pleasingly surprised as the performance obtained which is nearly equal to that of the land plane. The ship takes off from the water in eight seconds in still air, and climbs at the rate of 450 ft. the first minute. This is nearly the same as a Waco. The experimental flying was done at Lake Zurich, Illinois, which is only a mile in diameter and is completely surrounded by tall timber which causes considerable down draft.

This is the first sea plane that has been built to fly from such a small lake. It has been flown from this lake in all kinds of weather, both high winds and no wind, and has no difficulty in getting up and out of the lake safely and still be in gliding distance of the lake at all times. It is possibly due to the extremely low take off and landing speed that the plane leaves the water so quickly.

The pontoons themselves weigh 30 lbs. each, are 9 ft. 6 inches long, 12 inches deep and 16 inches wide. They are approximately 4 ft. 3 inches apart on centers. Construction consists of a wooden skeleton over which water proof plywood is used, this being secured to the frame work by brass wood screws. Over the entire construction linen fabric is doped and six (6) coats of regular aircraft wing dope applied.

(Continued on Page 174)

Ride Away —Get the THRILL of Your Life



FEEL the rushing getaway as you open the throttle — the quiet speed as you flash down the road — the eager power as you zoom over a hill!

That's motorcycling, on a Harley-Davidson 45 Twin — and no other sport has such a "kick". You will find new thrills every mile—whether you ride on long tours, short jaunts, or just to work and back. And the total cost is barely 2 cents per mile, including everything.

Let your nearest Harley-Davidson Dealer show you the 1930 models — look over their new features and improvements. Ask about his Pay-As-You-Ride Plan.

"45 Twin" for 1930
— a very popular model. The ideal solo motorcycle.

Mail the Coupon!

HARLEY-DAVIDSON
Motorcycles

Mail This Coupon
—for literature showing our full line of Singles, Twins, and Sidecars. Prices range from $235, f. o. b. factory.

HARLEY-DAVIDSON MOTOR CO., Dept. MM., Milwaukee, Wis.
Interested in your motorcycles. Send literature.
Name.....
Address.....
My age is ☐ 12-15 years ☐ 16-19 years ☐ 20-30 years ☐ 31 years and up.
Check your age group.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific, chemical, practically inexhaustible mineral at no exorbitant price, we have at last succeeded in producing this remarkable LUMINEON PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. **THE DARKER THE NIGHT, THE MORE BRIL-LIANTLY SHINES.** Quite sufficient to enable you to see the time of your watch or clock will enable you to tell the time by night. You can coat the part indicating the hour hand, the figures, or the whole face, as you prefer. Will make your watch, Compass, Thermometer, Gauge, Scale, Door, Knob, Speedometer, etc., etc., glow, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 942 RACINE, WIS.

CIGARETTE MAKER

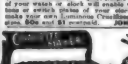
Roll your own and save money. Neater and more even than ball tin. Use your favorite brand of tobacco. Neat, useful, handy. Made of nickel plated metal. Takes any size cigarette. **25c, 2 for 40c.**

GOOD LUCK RING

Very striking, rather unusual ornament. Silver finish, with a real four-leaf clover, two brilliant flashing gems and a horseshoe in relief. Only **25c** each.

Exploding Cigarettes

JUST LIKE ORDINARY CIGARETTES, BUT SUCH A STARTLER! The next one taken too generous cigarette you offer your friend will cause him to drop it like a hot potato. Then when each cigarette is about half smoked it explodes with a loud BANG! Lots of fun. Only **25c** each; 4 for **75c**; 12 for **$2.50**. Will give a very great surprise to any one of with a loud BANG! A great practical joke-never yet entirely had since. **Prices 25c-50c.**



NOVELTY BADGES

Kissing Parrot Pin *Garter Inspector Pin*

Two very novel metal badges, nickel plated, with pin and spring, on end of all proportion to their trifling cost. Only, each, **10c**; 3 for **25c**; 7 for **50c**; 15 for **$1**; postpaid anywhere.

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. Put up in boxes like Safety Matches. As the victim tries to light one he gets a surprise. Lights one he gets a surprise. Price 10c per box. 3 boxes for 25c, 12 for 75 cents.

10c

MIDGET BIBLE

GREAT COMMUNITY BIBLE—Smallest Bible in the World. Size of it is 1 1/2 x 1 1/2 inches. Printed in large clear type. Good for long use. Contains over 400 pages. Will be sent to be represented. Make good money selling Bibles at 25c each. Sample, postpaid, 25c. Per dozen, $2.50. Per hundred, $17.50. Per thousand, $150. Also assortment of Bibles, Testaments and Books, 2 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible, 10c extra.

STAR TOY MAKER

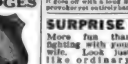
Greatest boys' book written. This how to make a Pinhole Camera, a Canon, model catapult, a Telephone, Boomerang, Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Fuse, Battery, a Sand Blast, a Dog Sled, Bird House, Rabbit Yard, and dozens of other things. 150 illustrations. **PRICE 25c postpaid.**

STAGE MONEY

Withabunch of these bills, it is easy for each person of limited means to appear prosperous by dashing off a three bills with a proper

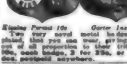
flourish at the proper time and peeling off a handsome bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 25c, 120 for 50c, or $1.50 thousand postpaid.**

Wonderful X-Ray Tube



A wonderful little instrument producing radical illusions both surprising and startling. With it you can see what's apparently inside of your fingers, the lead in a lead pencil, the interior anatomy of a watch case, and many other startling illusions. A mystery that no one has been able to explain. Only **10c** each; 3 for **25c**, 7 for **50c**, 15 for **$1**. Postpaid anywhere. Johnson Smith & Co.

MAGIC NOSE FLUTE



The Magic Nose Flute, or Hummaniflute, is a unique and novel instrument that is played with nose and mouth simultaneously. It is a little thumb in passing sound like a flute, and after a little practice will enable you to produce very creditable music that somewhat resembles a violin. There is no fingering and core you have mastered it you can play all the popular airs with ease and ease. Makes good as an accompaniment to a piano or organ. Will be a source of wonder to the client as to what use it is or anything.

Post Paid **10c**

NOSE BLOWER

Wonderful new nose blower that causes it to vibrate like a trombone. Now the secret is out. Any one can learn to torment us. It is a startling, but fascinating instrument. Practised by famous musicians and your friends will think they heard a steam engine or something. You can imitate hideous noises to your having a very bad cold and how on the 4th of July. Only **10c** each; **3 for 25c**, or **7 for 50c**, postpaid

Serpent's Eggs

Size contains 12 eggs. When lit with a match they gradually thicken itself into a long, black, writhing serpent 4 feet long, which curls itself up in a most life-like manner. **Prices one box, 10c postpaid; 3 for 25c**

JOHNSON SMITH & CO.

Dept. 942 RACINE, WIS.

A 64 page Edition of our new CATALOG mailed with every order. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, seasonal and advertising goods, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Coin, Money Order, Check or unused U. S. Canadian and Foreign Stamps for all articles listed above.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs **Special Offer**

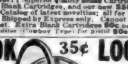
1 Blank Cartridge Pistol
100 Blank Cartridges
1 Book-paper Handy Catalog of Novelties

ONLY $1.50

The Lot Shipped Express Only Quick Order

Wall made and effective, modelled on latest type automatic. Shoots a charge of powder sufficient to make a report like a pistol. It takes standard 22 Cal. Blank Cartridges—obtainable everywhere—cash with order. Special Reduced Price: Regular quality Blank Cartridge Pistol, 100 Blank Cartridges, and one copy of the Big Louie Catalog of latest novelties, all for only $1.50. Shipped by Express only. Cannot go by mail. Extra Blank Cartridges, 100 for 50c. Extra Special Holster Leather Pistol for pistol **50c.** N. C. O. D. shipments.

LOOK 35¢ **LOOK** **Wonderful Instrument**



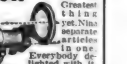
Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and Interesting. Lots of fun and all the time you will be Examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Spy Glass, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a magnifying Glass for examining all sorts of things. Cost is worth all the cost to locate even one painful cinder in the eye. Fits in flat size in the pocket. Something every one will use. Don't miss it. Sent by mail. Only **35c** or **3 for $1.00**

JOHNSON SMITH & CO., DEPT. 942 RACINE, WIS.

INVISIBLE INK

The most confidential message can be written with this ink, further writing makes it the work. Chemical is colorless, and upon the paper is invaluable for many occasions. Keep your postals and other private memorandums away from prying eyes. Price, 10c Pint; 3 for 25c; 12 for 75c. Postpaid anywhere. Only 10c a Bottle; 3 for 25c.

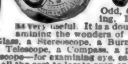
Rubber Chewing Gum



It is just like a regular package of gum in appearance, and when opened looks exceedingly. Of course no one gum wants to chew it after they know what it is. There's a world of fun in this rubber chewing gum. Only in the package. Price, 10c Pint; 3 for 25c; 12 for 75c. Postpaid anywhere. Only 10c a Bottle; 3 for 25c. Johnson Smith & Co., Dept. 942 Racine, Wis.

Watch Charm Pistol

$1.75



Exact reproduction of a real pocket pistol. Has REAL BARK and PARTICLES of miniature size. Length of pistol is 1 1/2 inches long, with handle for carrying and for attaching to watch chain. Fires a real loud bang, and is a dandy. Only **$1.75** each, postpaid. Accidentally fired, it will not injure the user. Order **No. 1** Watch Charm Pistol. Price, postpaid, **$1.75**. Johnson Smith & Co., Dept. 942 RACINE, WIS.

MICROPHONE TRANSMITTER BUTTON

$1.00 Postpaid

You can easily make a highly sensitive detective, dictaphone, or transmitter from a telephone receiver and the secret button. You can build your own outfit for less than buying expensive apparatus and get just as good results. You can install an outfit in your home and hear everything being said in any room in the house. You can connect up different rooms of a house, so that you can hear what is going on in other rooms. The set is being used on the sly. It is being used on the sly. It is being used on the sly. It

BOYS! BOYS! BOYS!

Throw Your Voice

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

THE VENTRILO

is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE THROAT**, or **VENTRILO**, you can imitate many kinds of birds, animals, etc. Remember you get everything for **ONLY TEN CENTS**—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat**, or **Ventrilo**, and our big 600 page catalog of novelties, tricks, puzzles, masks, books, etc., **ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY 10 cents**

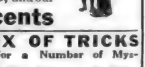
MEXICAN JUMPING BEANS

Scientists are unable to give a reasonable explanation for their purpose nature created these curious **Jumping Beans.** They are found growing on small trees in the high mountainous regions of Mexico. The Beans **Wiggle, Move, Jump, Flop Over, Etc.** It is amazing how they keep up this endless activity. Send for a few of these great curiosities. **Three Sample Beans** sent for **25c, 12 for 75c, or One Gross (144) for $7.50 Postpaid.**

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment.....$1.00

ANYONE CAN DO THEM



It is great fun surprising your friends. Get this Conjurer's Cabinet, and you will be the envy of them all in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BELL AND VASE TRICK (a wooden ball is placed inside, and upon removing the lid has disappeared, and is found somewhere in your pocket); the ASHTRAY TRICK, the CANDLE TRICK (a candle is placed completely in one tin, but appears in another); DISAPPEARING COIN BOX (a coin, placed in the wooden box, disappears entirely or changes into that of another denomination); the GLASS GOB-LET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a ribbon is pulled out of your mouth, and more ribbon pulled out of your mouth); the MYSTERIOUS BANDKERCHIEF TRICK (two handkerchiefs are shown, but yet only one is used in the trick); the WIZARD'S RING COIN TRICK, the ENLARGED BOTTLE TRICK, and last, but not least, the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath; yet no one has touched the hat), and, last, but not least the GREAT PHANTOM CARD TRICK, of two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other tricks and illusions are fully explained for which you can easily make or procure the necessary apparatus. Price complete, postpaid, **$1.00.** JOHNSON SMITH & CO.

U. S. BABY TANK

It goes with real Yankee Pep—by its own power

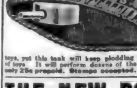
Most remarkable toy ever invented. Runs under its own power. Starts when the Tank is held or over the floor or table by placing it down. It will crawl along, overcoming all obstacles in the same like manner as the larger Tank that proved so useful in the great war. What makes it go is the mystery. It will keep on there is no need to attach to wind up as is usually understood with mechanical toys, you this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts. The Price only 25c prepaid. Stamps accepted.

JOHNSON SMITH & CO.

RESURRECTION PLANT

Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep a nut up in water again. **PRICE, 10c, 3 for 25c, 75c dozen, postpaid.**

THE NEW POTATO PISTOL



Uses Potato for Ammunition

NEW

This is surely the most ingenious of all air pistols. For ammunition *ALL YOU NEED IS AN ORDINARY POTATO*, and that isn't hard to get. Merely slip the point of the barrel of the pistol into a potato, as shown in the illustration, withdraw the pistol and fire. Nothing could be simpler. It fires quite a distance, goes off with a report like a toy gun, and fires as often as you desire. The pistol is made entirely of metal. Price Postpaid, Only 25c.

250 Magic Tricks 10c

An excellent little book containing 250 Parlor Tricks, with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illus. Sent postpd. to any address for only 10c. 3 copies for 25c.

Comical Motto Rings

Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (no resemble platinum), with wording on enamelled, as illustrated. **Price only 25c Postpaid.**

Great Fire Eater

A great trick by which you can apparently breathe fire from mouth, to the horror and consternation of all. Quite harmless. All apparatus necessary sent complete in box for **ONLY 25c.** P. S. & H. JOHNSON SMITH

SQUIRT ROSE

25c

A REAL STARTLER. This is the most popular of all squirt tricks. The flower in your coat looks so fresh and sweet that everyone is tempted to inhale the delightful perfume. Then is the moment to press the bulb. Gawshlikes, don't they jump! There is a very tiny rubber tube that easily reaches to the pocket of your coat or trousers, and the bulb is large enough to make a dozen squirts with. Price complete, postpaid, each, or 3 for 50c postpaid.

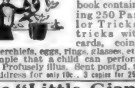
SEEBACKROSCOPE

Please this clever instrument is for use by eyes, to see what is going on behind your back. Very interesting experiments can be made. You can think you are looking. Just like having eyes at the back of your head. **PRICE 25c POSTPAID**

Send remittance (Postage Stamps accepted) for all articles listed above. Also in our other ad on previous page

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50



A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to purchase and use of a fifty or seventy-five dollar machine. This machine is confidently recommended to meet their requirements. It is simple, it is compact, it is constructive, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet and figures are arranged in the most convenient form for rapid writing, the capitals and most frequently used are so grouped as to enable a person to write rapidly. The machine is 12 in. long, 5 in. wide, 2½ in. high, and the punctuation marks being together. With the machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send free a 32 page booklet telling how to write rapidly. The machine complete $1.50 by mail postpaid to any address in the world.

JOHNSON SMITH & CO. Dept. 042 **Racine, Wis.**

Men don't just fall into jobs of **big pay**. positions they prepare for the big chance **before** it comes. Shake up your mind today—what you want to be, then take the first step **at once.** You don't have to go to college to get ahead. Other men have gone there for you and have put the things they learned there and through years of practical experience into easily understood books which give you a short cut to a **better** and a **bigger** job.

We have picked 13 of the best paying professions and have published for your benefit new editions of the most practical, the most valuable books we have ever printed on the subjects covered.

JIFFY INDEX

Our new Jiffy Index makes each book a **quick reference work**—no time need be wasted in search or study—put your finger on the **facts** you want **instantly.**

Special Price List of Pay-Raising Books

Automobile Engineering, 5 volumes, over 2,000 pages	$24.80
Civil Engineering, 9 volumes, 3,900 pages, 3000 pictures	34.80
Practical Business Administration, 12 volumes, 3,400 pages. Extra volume containing self quiz reading course of 80 lessons included free	39.80
Electrical Engineering, 8 volumes, 4,300 pages, 3,200 illustrations	34.80
Modern Shop Practice, 7 volumes, 3,250 pages, 3,000 pictures	29.80
American Law and Practice (with reading course), 13 volumes, 6,000 pages, Illustrated	49.80
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SHIPPED FREE

Words alone cannot describe the full value these books may be to you, so we ship Free for Examination. Pick the set you want, the price is plainly shown, but **Send No Money;** just your name and address, and the books will be sent promptly.

Take fifteen full days to read, test and examine them. You'll realize at once what a tremendous force for a better future they can be. After fifteen days you send only $2.00; then $3.00 per month until the balance is paid. **There Are No Interest Charges of Any Kind;** the price shown is the total cost.

MEMBERSHIP FREE

Anyone who takes advantage **now** of this opportunity to "Raise his Pay" will be given absolutely free, a certificate of membership in the American Technical Society, which entitles him to full consultation privileges with our experts in his chosen field. This is good for a whole year and is of tremendous value in solving special problems.

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for **Fifteen Days'** examination. I will examine the books thoroughly and if satisfied, will send $2.00 within 15 days and $3.00 each month until I have paid the special price of $..... If I decide not to keep the books I will return them at your expense at end of 15 days.

Name .....

Address .....

Reference .....

Letters from the Shop Mail Box

(Continued from Page 170)

A step is incorporated in the pontoons approximately 1/3 of the way from the rear with two one-inch vent pipes feeding the step. The pontoon gear is so constructed that the change between the landing gear and pontoon require no alteration whatsoever of the fuselage or the fittings. The maneuverability of the plane does not seem to be hampered with the pontoons, and it will carry through any stunt and readily comes out of a spin when opposite control is applied.

Mr. Heath states the full bill of materials for the floats can be had for about $50. Such a seaplane should make a wonderful little job for prospecting in Canada, eh?

* * *

HERE'S a good letter from Ian L. McKenzie. who seems to have been following aviation for a long time:

The Editor,
Modern Mechanics and Inventions,
Robbinsdale, Minn.
Dear Sirs:

I have been a reader of your magazine from its inception, and think it the finest thing of its kind that has been published. Your designs of light aeroplanes have been simply marvelous, and no doubt have created a great deal of interest.

I remember reading in the British magazine FLIGHT, an article on the design and building a light tractor biplane, and explaining very thoroughly every step in the design and building some years ago. I believe it appeared some time during 1916 or 1917, and I think if you could get permission to publish this series of articles it would prove very interesting to your readers.

There also appeared a series of articles on a light seaplane designed by Muller in Everyday Engineering Magazine, which also

(Continued on Page 176)

Let Me Show YOU How to Be "BORN OVER AGAIN!"

PICTURE yourself as THE MAN YOU'D LIKE TO BE. Picture yourself with the strong, handsome body of an athlete, broad across the shoulders, deep-chested, slim and trim at the waist-line—*and covered, from head to foot, with powerful bands of brawny muscle!*

Would you like to be reborn into THAT MAN?

"The age of miracles is past," you say. Is it? Send for my wonderful FREE BOOK and see! Read that letter at the right. Then read *this* letter from Franklin Keyfauver, of Keedysville, Md.

"I feel as if I were born all over again. I no longer remain in the back rows of athletics as I did before writing to you. I am very grateful to you for the muscles I now have and thank you many times."

And read THIS:

"It is impossible to express my gratitude for such a miraculous change in so short a time and to put it mildly, I am just amazed." (Signed) Cedric Dawe, Toronto, Can.

And THIS:

"Everyone asks me what I have been doing to myself lately and I just tell them it was Titus who made me over from a weakling to what I am today." (Signed) Duncan Robertson, Convert, N. J.

I could go on for page after page giving you instances like these. I could tell you about men of practically all kinds and conditions, young and old, who testify to the amazing change I have made in them—who tell how they have been freed from their weaknesses. I could show you pictures of men transformed from puny weaklings into powerful, muscular PANTHER-MEN.

But I don't want you to take my word for anything. I WANT YOU TO SEE WITH YOUR OWN EYES WHAT I CAN DO FOR YOU.

Watch Yourself *CHANGE* in the Next 30 Days

Make This 30 Day Test

TRY Titus Training for the next 30 days. See whether YOU feel as if you had been "born over again."

READ THIS!

John Kohler, Jr., of Windber, Pa., writes: "Gee, I feel great this P. M. I feel as though I could clean up on a herd of elephants, not only wild-cats. I'm born all over again, and the credit goes to you and your apparatus. Worked real hard this month but I don't feel tired as I did at one time. Those days are past. My friends notice my sudden change."

One man writes me that he wouldn't trade the set of muscles I gave him FOR A MILLION DOLLARS. Would YOU? Wait and see!

A Few Minutes a Day and Watch those Muscles GROW

Man, here's a proposition you CAN'T refuse. You've heard about my "MIRACLES IN MUSCLES"—now see one of them worked *on your own body.* It will just take a few minutes a day—in the privacy of your own room. Follow my simple, easy instructions. No hard work—just a few minutes a day of FUN. My free book tells all about it—mail the coupon.

Let me show you how I develop *every* muscle in the human body—how I work on your internal organs, too, to tone and strengthen them—how I charge your whole system with surging energy and vitality.

Get the Facts FREE

Don't send a cent. Without cost or obligation I'm going to send you a book *that will open your eyes.* You'll be amazed at the wonderful possibilities of scientific body-building, at the *speed* with which you get RESULTS. Send for your copy of MIRACLES IN MUSCLES *now.* It's yours absolutely FREE—and no salesman will bother you. Mail the postcard or write—but, brother, do it NOW.

TITUS 851 BROADWAY NEW YORK, N.Y.

TITUS, Dept. W-164
851 Broadway, New York, N. Y.

Dear Titus: Okay, send that wonderful, big illustrated book of yours, "MIRACLES IN MUSCLES." Get it to me by return mail, without the slightest cost or obligation on my part.

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Address .....

Town ..... State .....

IDEAL – THE MOST RELIABLE NAME IN MODEL AIRPLANES

The IDEAL
American Eagle

The Most Advanced Development in Flying Model Airplanes

Wing Span: 26 in. Weight: 3½ oz.

AN ENTIRELY new, light-weight, fast-flying Model; distinctive appearance, realistic in flight, unique construction details. Balsa wood Fuselage, with specially designed aluminum bulkheads; built-up wings with ready-formed ribs; removable tail assembly. Finished in modern color decorations. Just the Model Airplane you have been wanting; simple in construction, and a reliable, fast flyer.

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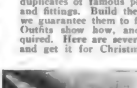
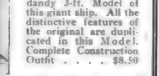


FORD MONOPLANE — 3 dandy 3-ft. Model of this giant ship. All the distinctive features of the original are duplicated in this Model. Complete Construction Outfit $8.50

New York-Paris Monoplane—3-ft. Model of the most famous airplane in the world. A Model every amateur aviator should build and fly. Complete Construction Outfit, $7.50



FOKKER MONOPLANE; 3-ft. Model "North Pole" type. Complete Construction Outfit, $8.50

DeHAVILLAND BiPlane; 3-ft. Model of this famous original. Complete Construction Outfit $7.50

Cecil Peoli Racing Airplane; 36-in. size. A Championship Winner. Complete Outfit . . . $3.75

Ask for IDEAL Model Airplanes in your local Toy, Hardware or Sporting Goods Store. If unobtainable, send your order direct to us. (West of Denver, Colo., and in Canada, add 10% to the prices above.)

64-Pg. Catalogue of Models, Parts, Materials for Model Builders, 5 cents.

IDEAL AEROPLANE & SUPPLY COMPANY

Established in 1911 — 13 years ago.

26-28 West 19th Street, New York City.

Letters from the Shop Mail Box

(Continued from Page 174)

might prove interesting. I would also like to see in your magazine an explanation with examples of the absolute coefficients as used in the reports of the National Advisory Committee for Aeronautics, and showing their application in the design of light aeroplanes, with all the necessary examples and calculations used in the design of light planes. Very truly yours,

IAN L. McKENZIE.

Mr. McKenzie had some good leads in mind when he wrote us, but as *Everyday Engineering* went out of business some ten years ago, the plans for the seaplane he has in mind would hardly measure up to the modern Heath-Henderson seaplane. The dope on wing sections is contained in a brief way in the 1930 FLYING MANUAL.

* * *

ANOTHER lightplane fan, Philip Dypski, who lives in Baltimore, sent us a clipping from *The Baltimore News* which showed a picture of his plane. He built it somewhat along the lines of the Russell Monoplane, but seems to have departed from the original in several ways, such as decreased span, increased wing height and landing strut length. A short bit of correspondence brought a photo from Mr. Dypski, which appears below.

* * *

A RABID radio experimenter is Tony Stubbs, living 'way up in British Columbia. He wrote our radio editor as follows:

Dear Sir: Okanagon Mission, B. C.

I have constructed the one-tube radio designed by yourself and published in the March number of Modern Mechanics and it works extremely well. I have got about twenty-five stations, the two farthest being in Chicago, a distance of about 1700 miles. I should like to know whether it is possible to increase the set to either two or three tubes, what batteries, etc. would be needed, and also how to use two sets of earphones.

Yours faithfully, TONY STUBBS.

(Continued on Page 184)

Be The Man Behind The Camera

ADVENTURE—thrills—more action in a week than the average man sees in a lifetime. When you're a motion picture cameraman the world is YOURS! You can travel, if you wish, or there are thrills galore close to home. As a news-cameraman you can be on the spot when things happen—there's no limit to the things you can see and do. Then, of course, there are the big picture studios where you come in daily contact with all the movie stars and actually take the pictures that millions of people see.

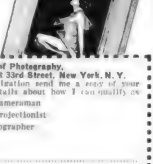
Adventure — sure — plenty of it — AND BIG PAY, TOO! Expert cameramen earn from $60 to $250 a week. Thousands of opportunities await the trained cameraman—opportunities offering fascinating work, big pay, and unlimited chances for advancement. Best of all, you need no previous experience to qualify for one of these well-paid positions—to train for the position of your choice.

Billion Dollar Photographic Field Needs You!

Motion picture photography is just one of the many big-paying branches of the billion dollar photographic industry. All over the country today there's a crying need for expert projectionists—for photo-finishers and trained commercial photographers. No matter which branch of the work you select there are sure to be scores of positions awaiting you—positions paying $2,000 to $12,000 a year and offering unlimited opportunities for advancement.

We Train You at Home in Your Spare Time

Pick the branch of photographic work you like best—we'll train you for it, in your spare time. Previous experience unnecessary. Age or lack of education no obstacle. If you can read and write English we'll teach you, through our Simplified Home-Study Method, all there is to know about Motion Picture Photography, Projection, Commercial Photography or Photo-Finishing. Our Employment Bureau helps you secure the position of your choice.



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Let us tell you how you can quickly qualify as Motion Picture Cameraman, Projectionist, Commercial Photographer or Photo-finisher. Our big FREE book gives details about this billion dollar industry, and explains how you can easily step into a well-paid position. Fill in the coupon —check off the branch of photography you're most interested in, and mail it NOW! It means happiness—success for you!

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Without cost or obligation send me a copy of your FREE book and details about how I can qualify as

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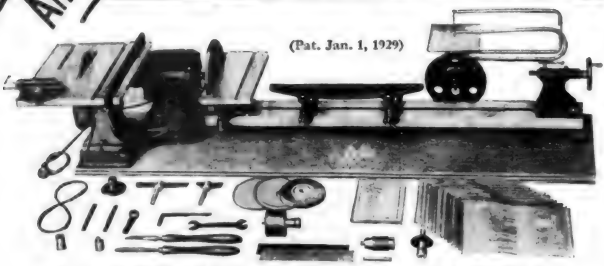
Announcing—

The NEW 1930 Models

(Pat. Jan. 1, 1929)



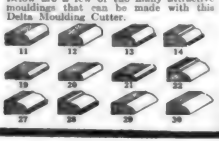
"Delta" Electric Handi-Shop

A complete motorized workshop for craftsmen including all necessary equipment for Circular Sawing, Wood Turning, Scroll Sawing, Sanding, Drilling, Grinding and Buffing. Full instructions and blue prints furnished.

New "DELTA" Moulding Cutter

Cuts Over 50 Moulding Shapes With Only 4 Sets of Blades

Interchangeable high speed blades produce over 10,000 cuts per minute at 3500 RPM. Blades require no individual adjustment. Quickly and easily locked in position. Special guide fence. Unusually low price. Below are a few of the many attractive mouldings that can be made with this Delta Moulding Cutter.



Practical Design—Dependable Quality *Plus* Many Exclusive Features

that's what you find in every woodworking unit bearing the Delta trademark. Craftsmen, artisans, farmers, mechanics—all who use wood in their daily labors or spare-time hobbies—are delighted with the sturdy construction, splendid efficiency and **moderate** cost of Delta equipment. They appreciate keenly such practical constructional features in the Handi-Shop as:

1. **Two-shaft motor that permits carrying on two important operations at one time without continually dismantling set-up.**
2. **Heavy U-shaped Lathe Bed (no rods) guaranteed not to chatter.**
3. **Automatically Oiled Bronze Bearings.**
4. **Patented Tilting-Tables.**
5. **Circular-Saw Raising lever.**
6. **Absence of interference when sawing large pieces of lumber; and many other important improvements found only in Delta products.**

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For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. You will learn also how you can try any Delta equipment for 10 days under actual working conditions at our risk. Your choice of three convenient payment plans. Mail coupon on opposite page today. It describes numerous items of interest to those who work with wood.

Delta SPECIALTY CO.

Delta Woodworking Units
for HOME CRAFTSMEN, FACTORIES, SHOPS, CONTRACTORS AND FARMERS

The introduction of the Delta Jointer and Circular Saw Units marks a new era in moderate-priced woodworking equipment. Now, for the first time, are available sturdy, practical machines in compact, convenient form at price levels astonishingly low. The new Delta Units include:

Combination 4-Inch Jointer 8-Inch Circular Saw Motor Driven

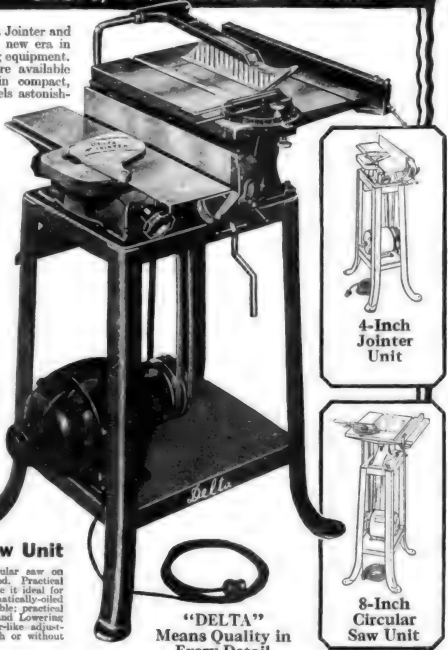
A convenient, efficient combination. Permits sawing, sizing, and smoothing in one quick operation. Both Jointer and Circular Saw are run from the same motor with separate belts. Neither Unit interferes with other. Can be operated together or separately. Mounted on sturdy welded steel stand of convenient height. A rugged portable outfit at an attractive low price. Furnished with or without motor as desired.

4-Inch Jointer Unit

Consists of new Delta 4-inch Jointer mounted on separate welded steel stand. Produces smoothly finished work in surprisingly short time. Built to give years of satisfactory dependable service on production work. Incorporates numerous exclusive features such as Self-Aligning Fence with accurate graduations permitting fence to be set quickly at any angle from 0°–45°; Fool-proof guard; Automatically-oiled bronzed bearings; Non-slipping V-belt drive. Furnished with or without motor.

8-Inch Circular Saw Unit

Consists of new Delta 8-inch circular saw on gracefully designed welded steel stand. Practical design and sturdy construction make it ideal for steady production work. Has Automatically-oiled bronze bearings; Patented tilting table; practical Miter-gage and Rip gage; Raising and Lowering Crank Screw permitting micrometer-like adjustment; V-belt drive. Furnished with or without motor.



4-Inch Jointer Unit

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Why pay an extravagant price for strength— here's an opportunity to get all the equipment you require along with an excellent course of instructions for only $5.00. Realize your ambition and develop muscles of a super-man. Get strong and amaze your friends. We show you how to perform master feats which now seem difficult—or if you just want physical culture for your health's sake, this equipment is just what you need. With this special offer you save at least $20.00. We furnish a ten cable chest expander which is adjustable to give resistance up to 200 lbs. It is made of new five extra strength, springy rubber so as to assure long wear and give the resistance you need for real muscle development. You also get a pair of patented hand grips for developing powerful grip and forearms.

We include wall exercising parts which permits you to develop your back, arms and biceps—real muscle movers. You have that business men and athletes, too, first show their ape in their hat. Develop your leg muscles with the foot strap which we furnish. This will give you speed and endurance—but that isn't all that you get. In addition we include a specially written course which contains many dangerous short-cuts you love to develop any part of your body on which you are weak. Also a pair of hand grips and pair of wrist developers. Your chest, arms and legs will respond from their use. And soon while you can put in on this special offer. It might be withdrawn, so mail the coupon.

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All of the terms printed on this page are included in this offer. Simply fill out coupon below, giving your name and address in the space below and rush it to us. We will send your package at once by return mail, the wall parts, a pair of hand grips, foot strap and the course by return mail. Pay the postman only $5.00, plus the few cents postage on delivery. (If you prefer to send check or money order in advance, we pay postage.)

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Note:—No C.O.D. orders to foreign countries or Canada.

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Cost of Oil System Cut to Fraction of Present Prices

The Ford of Oil Burners. Built to last a lifetime. Guaranteed. Complies with all ordinances. Actually safer than an ordinary kitchen gas range!

Fits Any Furnace or Stove

The Laco Oil-Gas Burner in one minute turns your present hot-air furnace, steam or hot-water heating system, parlor stove, range, etc., into a modern, up-to-date oil heating system! Nothing to adjust. It's installed and you forget about it. Operates quietly and does not interfere with the radio.

Easy Terms

Write for full information. Tell type of heater you have. Tell how you have. Special low Price offer if you act now.

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Dealer—Salesmen Wanted

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GUARANTEED 10 DAYS' FREE Trial

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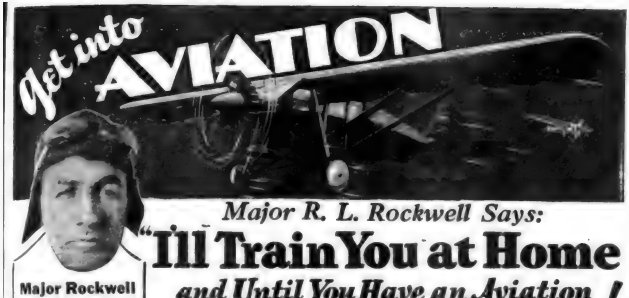

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The big money in Aviation does not go to the novice or apprentice. Only TRAINED men can command the high salaries. Employers are glad to pay big money for men who know Aviation—builders, mechanics, service and maintenance men, and flyers. Let me prepare you for one of the many high salaried Aviation jobs open to the trained man. I will prepare you to take your place in the most fascinating, fastest growing industry in the world. Act now while my special offer lasts. Rush this coupon to me for a copy of my famous free book.

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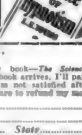

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FREE-TRIPS to Hollywood Contest

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January issue of

THE VOICE OF SOUND PICTURES

Screen secrets

Magazine

And that isn't all—you can dine and dance with your favorite movie stars, visit their homes, and watch them work on the set, as the guest of First National Pictures and SCREEN SECRETS.

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If your news dealer can't supply you, send 25c to SCREEN SECRETS Magazine, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the January issue will be mailed to you immediately.

Thank You for Mentioning Modern Mechanics and Inventions for January When Writing to Advertisers

You Can Be a "Registered" Radio Technician in 90 Days!

Tremendous Opportunities For Trained Men in This Fast Growing Industry

The School of Engineering of Milwaukee, home of broadcasting station WISN and amateur station W9SO, now offers a complete practical 90 days' course in radio to ambitious men. This great electrical school is helping to supply the great shortage of trained radio technicians by giving the most practical training ever before attempted in the radio industry

Operating Room of Broadcasting Station WISN at School of Engineering

Federated Radio Trade Association Endorses S. of E. Radio Graduates

Read this letter from Michael Ert, Past Pres. of Wis. Radio Trade Ass'n, and now Pres. of the Federated Radio Trade Ass'n:

"We have investigated your Radio and Broadcast Course now being given at the School of Engineering of Milwaukee, and are acquainted with the high quality of educational work you have been doing for years.

Therefore, the Wisconsin Radio Trades Association hereby authorizes you to prepare men to receive Radio Serviceman's Registration Cards, classes A, B or C, of the Wisconsin Radio Trades Association."

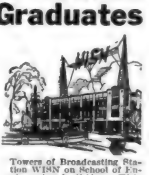
The Wisconsin Radio Trades Ass'n now compels every radio service man to pass severe examinations and become registered. Dealers are tired of untrained, incompetent help. Radio trade associations the country over are planning to follow Wisconsin's example. The School of Engineering is the only institution in the country whose course is approved by a radio trade association. Graduates of the S. of E. are "registered."—14 S. of E. men successfully employed by Radio Corp. of America Photophone, Inc.

Most Thorough, Practical Radio Course in America

Here in this big splendidly equipped electrical school (from which Station WISN is operated) you can secure in three months the most thorough, the most compact, practical radio training offered anywhere. Covers entire field of radio! Complete course includes Radio Laboratory Practice, Radio Telephony Theory, Radio Transmission, Code Instruction, Electrical Mathematics, Service and Installation, Radio Sales and Merchandising. Daily broadcasting from WISN. All training is 100% practical. You learn in three short months!

Part-Time Job While You Learn

If you can finance your tuition we will assist you in getting part-time work to help pay living expenses while at school.



Towers of Broadcasting Station WISN on School of Engineering building. This station now being operated by School of Engineering.

Television Included

Complete Radio Course also includes study of fundamentals of Television and latest developments in that gigantic new field. Enables anyone to keep up with progress of this new industry.

FREE BOOK Mail coupon today for copy of catalog describing the S. of E. 90 days' Radio Course and our Earn-While-You-Learn plan. Write now! Classes Now Organizing.

SCHOOL of ENGINEERING of Milwaukee

Founded 1903 **Dept. MM-130, Milwaukee, Wis.**

School of Engineering, Milwaukee, Wis., Dept. MM-130

I am interested in your 90 days' Radio-technician Course. Send me, without obligation, FREE BOOK describing course in detail, also particulars about "Earn While Learning" plan.

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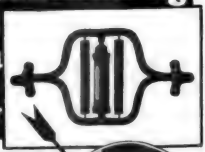

Amazing invention that ends all trouble, annoyance and expense of slamming doors, and brings fortunes to agents. Just one look at this clever device and the sale is made. Can be installed in a few minutes with just a screw driver. Saves nerves, besides enormous loss through broken glass and wasted fuel. Every office, factory, store, institution, or public building needs one for every noisy door.

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Kant-Slam is different from any other door control. It's not pneumatic, but is built on new oil principle, that controls door like human hand. Gives lifetime service without adjustments. Always efficient in any weather.

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Look! A full sized sample on miniature door furnished every active agent! Can I offer you more than that? An actual working sample mounted on an easy-to-carry, light weight miniature door. With this clever demonstrator you can't fail. Sales pour in, and in just a few minutes' time. Demonstrate this clever device—tell how it saves thousands of dollars each year in fuel and broken glass, and you're bound to make good. Mail the coupon for **Amazing Free Offer.**

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Kant-Slam is neat, compact, light in weight and is lowest priced control ever offered with a factory guarantee. Pays big commission that makes agents $15 a day and more, easily, just showing it. Simple demonstrator does all the work. Just take orders and collect the big commissions in ADVANCE!

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NOW—TODAY is the time to mail the coupon for TREMENDOUS FREE OFFER. Get in on the ground floor and clean up the profits being distributed among my representatives. Just open and shut your demonstrator 5 or 6 times a day and you'll be making $30, $40, and $50 a week just as easy as singing a song. You can't afford to wait, because territories are being taken as fast as we can hand them out—mail your name and address on coupon below, and I'll reserve your territory for you.

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KANT-SLAM DOOR CHECK CO.,
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GENTLEMEN: Please reserve my territory, and send me full details of your AMAZING FREE OFFER. I am not obligated.

Name .....

Address .....

Town ..... State .....

STRAIGHT LINE

Letters from the Shop Mail Box

(Continued from Page 176)

And here's the answer Tony got. We'd say he was doing well to get 1700 mile distance with one tube! Probably his isolated location accounts for it. Maybe television would come in well if such reception is possible with one tube.

Dear Sir:

I should say that you are doing extremely well with your one-tube set, to have covered 1700 miles with it, and during not such a favorable part of the year, either. Congratulations, and keep up the good work.

Yes, you can make it a two or three-tube job. I'd like to tell you how. But it would involve a lot of explanation, diagrams, etc., that could scarcely go in a letter. Besides, since other fans have written in with the same question, I've prepared an article going into the subject in detail, which will appear quite soon. So I'm asking you to wait for that. It won't be long now.

To use two pairs of phones instead of one, connect them in series; that is, connect one tip of one set to one phone terminal on the radio set, the other tip of the first pair of phones to one tip of the second pair, and the remaining tip of the second pair to the other terminal of the set. You see, in this way you force the current to flow through both pairs of phones alike. You will find this quite satisfactory.

* * *

ECHOES of MODERN MECHANICS' first "Win Your Wings" contest are still heard in the editorial offices. One of the prize winners from far off Honolulu writes below expressing his thanks for the free airplane ride which he won. Before reading his letter—and afterwards, too—stop and remind yourself that another great aviation contest is announced elsewhere in this issue in which the prize is a complete course in flying! The best part of it is that the contest will run every month for one solid year, so that if you don't win the first month you can try your luck again. Complete details are announced on page 92—and let us remind you that the first step in winning is to send in your entry at once. Now let's go on with Mr. Kondo's letter from that fascinating land of the pineapple and the hula:

1520 Liliha St.,
Honolulu, T. H.

Mr. Roscoe Fawcett,
Modern Mechanics Magazine,
Robbinsdale, Minn.
Dear Mr. Fawcett:

Your letter of July 29, including the five

(Continued on Page 188)

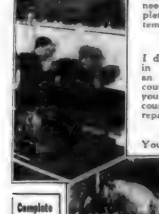
Learn ELECTRICITY

and in 90 Days' You Can Get a Big Pay Job

Get into this profitable profession. Get into Electricity where there is always an insistent demand for your services at highest pay—$50 to $150 a week. Learn to master the magical "juice"—the power that puts and keeps the universe in motion. I will teach you by the simple, practical personal instruction method. For many years I have been training men by this **Shop Plan System** which has proved to be the most successful method for making well trained electrical experts. Many of my graduates are now earning $50 to $150 a week and if you will put your future in my hands I'll prepare you to earn that much.

No Books---You Learn on Actual Machines

You learn on real electrical equipment, with real tools. My Special School Shops are fitted with Switch Boards, Generators, Motors, etc. You get first hand knowledge of A. C. and D. C. Armature Winding, House Wiring, Splicing, in fact everything you need to know to become an electrical expert. I also give you complete instruction on Automobile, Aviation and Radio Electrical Systems and Batteries.



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I'll Train You the McSweeny Way

I don't believe in books or printed lessons, or dry lectures. I believe in the practical shop way. I want every McSweeny Graduate to be an electrical expert, and that's what he becomes when he finishes my course. Here I put you into the very heart of electricity. I teach you every phase from A to Z—alternating and direct currents. My course is complete—Installation, substation work, motor and generator repairing, telephone, telegraph, and radio electricity.

No Experience or Education Needed!

You don't have to have any special previous education or training, to grasp my simple method of instruction. You don't even need to know anything about electricity now. I don't care if you can't tell a motor from a horse-and-buggy this minute—I guarantee that when you have finished my course you will know electricity thoroughly and be qualified to fill a big pay job. And if you are not, I'll refund every penny of your tuition.

I Guarantee Satisfaction

If, after completing my training you are not 100% satisfied and are not qualified to fill one of the big pay electrical jobs, I will refund every cent of your tuition.

Mail the Coupon

That's your next step right now. It will bring you my remarkable low tuition offer and also full details of how you can master this highly paid profession and in a few short weeks be ready to land a real job at real pay. Learn why you will like my school—why fellows say it's more fun than work to train the McSweeny Way. Start now to better yourself. Act at once. Mail this coupon for my famous Big Book — sent FREE. J. H. McSweeny, President.

(Write to Nearest School)

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Dept. E-13-R, 263 Madison St., Memphis, Tenn.

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McSweeny Electrical Shops.
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....Bookkeeper	....Surveyor (& Mapping)
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Dear Mr. Lamon: Send me your FREE Book, *"How to Raise Poultry for Profit."* I want to know more about my opportunity to make $2,000 to $5,000 a year, spare or full time.

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Orders from outside the U. S. A. are payable $3.25 cash with order.

If you order the Course at once, we will include a drawing outfit, consisting of artists' pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost.

1. Why do you want to be a pilot? See page 92.

Letters from the Shop Mail Box

(Continued from Page 184)

dollars for the free airplane ride which I won, came today.

Mr. Alfred Shuttlewood, president of the Hawaiian Aeronautical Industries, has promised me a hop longer than the ordinary hop. This is due to my connection with the school as a student and also because the papers here have been playing up the fact that Hawaii had one prize winner in the "Win Your Wings" contest.

I assure you I will always take great interest in your publication.

Air-mindedly yours,
YOSHIO H. KONDO.

* * *

Some of the Hangar Gang have built themselves a glider. Here's the letter they sent:

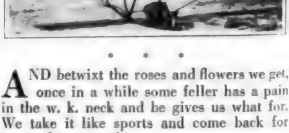
Dear Editor: Minneapolis, Minnesota.

Enclosed are pictures of a glider constructed from Modern Mechanic's how to build series. The young enthusiasts are Gene Mousseau and Bernie Veileaux of Southeast Minneapolis. The boys are sixteen years of age and displayed unusual skill in its construction. These pictures were taken prior to and after test flight. Afterwards the pine and wire pegasus was put on exhibition at the Minnesota State Fair. The garage in their back yard is the hangar and birthplace of air-minded South East.

Yours, The Hangar Gang.

* * *

We are printing below a photograph of their Northrop type glider. It appears to be a well executed job and the anonymous members of the Hangar Gang who did the work are to be congratulated.



* * *

AND betwixt the roses and flowers we get, once in a while some feller has a pain in the w. k. neck and he gives us what for. We take it like sports and come back for more. Listen to this:

Dear Sirs: Austin, Texas.

I felt that I had to write. You have many good articles in "Modern Mechanics", but they are not complete. It seems that

(Continued on Page 190)

BOYS Here is a brand new development in a model plane for you—an endurance model. It has many novel features which give it endurance and flying qualities that you have never before experienced. It will stay in the air for a minute—a minute-and-a-half or more. It is very light—weighs less than an ounce—and practically crash-proof. You can fly it again and again.

The American Red Racer is easy to construct—the outfit being complete in every detail, having all plans, parts, covering paper, motor, propeller and dope. You can complete it quickly and marvel at the flights it will make for you. Records of 150 to 400 feet have been made. With a heavier motor you can get great speed and distance.

The wing spread is 20 inches and the fuselage is built un—measuring 14 inches. A very powerful, flexible, long-running, smooth motor, as well as special bearing for propeller. This plane will fly wonderfully hand launched or will R. O. G. rise and make perfect 3-point landing.

The price is low—remarkably low—for such a perfectly designed plane that has so many flying qualities. You will want lots of these American Racers for yourself and your friends. It makes a wonderful gift.

Order yours right now—don't let a day pass without getting the fun and instruction that is in store for you.

Price postpaid complete only $1.00 or we will send 6 postpaid for $5.00.

Complete catalog showing other construction sets and ready-to-fly models from $1.00 to $5.00 given with your order, or send for 10c with free glider.

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Here's an opportunity for everyone to develop big muscles and obtain great strength by using this heavy tensioned PROGRESSIVE EXERCISER adjustable from 20 to 200 lbs. resistance. Complete instructions come with each exerciser. Get rid of those aches and pains, indigestion, constipation, headaches, etc., and build up your body and look like a real He man!

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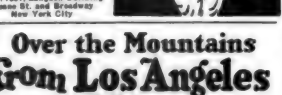
Over the Mountains from Los Angeles 559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Maybe more than FIFTY MILES TO THE GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

The Whirlwind Saves Motorists Millions of Dollars Yearly

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 50 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone. Mark A. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon."

P. F. Goersen writes: "24 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to gallon and 25% in speed."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motor. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasure. Why let the Oil Companies profit by your ignorance? Find out about this amazing little device that will pay for itself every few weeks.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED
FREE SAMPLE AND $100.00 A WEEK OFFER

Whirlwind men are making big profits supplying this fast selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer and full particulars sent on request. Just check the coupon.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days or the trial will cost you nothing. We invite you to test it at our risk and expense. You to be the sole judge.

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Gentlemen: You may send me full particulars of your Whirlwind Carburetting device and free trial offer. This does not obligate me in any way whatever.

NAME .....

ADDRESS .....

CITY .....

COUNTY ..... STATE .....

( ) Check here if you're interested in full or part time salesmen position.

Letters from the Shop Mail Box

(Continued from Page 188)

you think everybody knows everything about all you publish.

Your "Oudin Coil" was about half explained. I didn't know what a condenser was. I spent about three dollars for condensers, wire, spark coil, batteries, and about twelve hours of my time. AND, I made nothing. I changed wires a dozen times. The spark would jump about an eighth of an inch. Let's see if you will publish this letter and good, complete plans for a "Tesla Coil". I saw this coil somewhere, but don't remember where. It is a large coil which will make a spark jump a foot or more. It is on the same lines as an "oudin coil".

Yours,
Warren Smith.

We sent Mr. Smith the following letter, reading in part:

Dear Mr. Smith:

We are going to publish your letter in the "Shop Mail Box," and we are drawing at the bottom of this letter a sketch which will help you in making the Oudin coil.

We went on to explain the function of the condenser, wherein his trouble evidently lay, for at least a dozen Amateur Electricians made the coil and reported fine results, as witness this letter:

Dear Editor:

I built the Oudin Coil and got a licking from my dad. Everytime I made it spark I put half of the radio sets in the neighborhood out of commission. It sure works keen. The lady next door couldn't hear on her radio for sour owl feathers. I can puncture glass with the sparks.

Jim Watson.

That goes to show that Mr. Burton's article on the Oudin Coil "hit the button", as Andy Cramer, grease monkey at the Robinsdale airport, used to tell Freddie Resico when he made good landings in the "Win Your Wings" course of instruction.

* * *

AIRPLANES aren't the only things which MODERN MECHANICS fans build in those interesting home workshops of theirs. A correspondent from Detroit writes, quite appropriately to that city of the automobile, that he is building himself a baby car and requests the advice of the consulting editor:

Dear Editor:

I am a Modern Mechanics fan and have read every issue since it has been out. I am in the process of building a small auto and am using a Henderson motor for a

(Continued on Page 194)

Thank You for Mentioning Modern Mechanics and Inventions for January When Writing to Advertisers

What Would You have done with the

"TESTIMONY OF THE DEAD"

by CHESTER L. SAXBY

Read the amazing answer in the most extraordinary detective story you've ever shivered over!

In the JANUARY

Startling Detective Adventures

The New Fawcett Magazine

On Sale Dec. 5th

ALSO in This Issue—

Stories by H. Bedford-Jones, Nick Harris, George Dougherty, Ruth Biery, Jay Kalez, and others.

If your newsdealer is sold out, send 25c to Startling Detective Adventures, Fawcett Publications, Inc., Minneapolis, Minn., and a copy of the January issue will be mailed to you immediately.

What will you be doing one year from today?

THREE hundred and sixty-five days from now—what?

Will you still be struggling along in the same old job at the same old salary—worried about the future—never quite able to make both ends meet—standing still while other men go ahead?

One year from today will you still be putting off your start toward success—thrilled with ambition one moment and then cold the next—delaying, waiting, fiddling away the precious hours that will never come again?

Don't do it, man; don't do it.

There is no greater tragedy in the world than that of a man who stays in the rut all his life, when with just a little effort he could bring large success within his grasp.

Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, mail the coupon to Scranton, and without cost or obligation, at least get the full story of what the I. C. S. can do for you.

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Box 2322-C, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X in the list below:

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- ☐ Architectural Draftsman
- ☐ Building Foreman
- ☐ Concrete Builder
- ☐ Contractor and Builder
- ☐ Structural Draftsman
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- ☐ Electrical Engineer
- ☐ Electrical Contractor
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Reading Shop Blueprints
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Civil Engineer
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Gas Engine Operating
- ☐ Automobile Mechanic
- ☐ Aviation Engines
- ☐ Plumber and Steam Fitter
- ☐ Plumbing Inspector
- ☐ Foreman Plumber
- ☐ Heating and Ventilation
- ☐ Sheet-Metal Worker
- ☐ Steam Engineer
- ☐ Marine Engineer
- ☐ Refrigeration Engineer
- ☐ R. R. Positions
- ☐ Highway Engineer
- ☐ Chemistry
- ☐ Pharmacy
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- ☐ Navigation ☐ Assayer
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- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
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Each Set in individual Boxes; all packed in one shipping carton. Complete with interesting instruction Booklet.

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Live wire salesmen are dropping everything else and flocking to Ve-Po-Ad. Ve-Po-Ad brings them quick money and lots of it. Shapiro out in California made $475 in one week! You can "clean up" too! Only 10 sales a day in spare time will bring YOU over $90.00 a week! You need no previous sales experience—Ve-Po-Ad sells itself! If you are really interested in getting a steady, substantial income, write at once for full details of my MONEY-MAKING PLAN and FREE VE-PO-AD offers to new Agents. Do it NOW—TODAY!

C. M. CLEARY, Dept. 949
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A Gift Suggestion

DID it ever occur to you that you can make your friends happy by giving them a year-around gift? That their memory of you could be kept fresh every month of the twelve? Well, it can—and in a way that will make Christmas giving even more of a pleasure than it would be otherwise.

This year send them a year's subscription to **Modern Mechanics.** They'll enjoy it as you have. It will prove a gift they won't forget.

Send the names and addresses of your friends along with a money order for $2.50 for each subscription ($3.00 if your friends live outside the United States.)

A beautiful Christmas card will be sent in your name notifying your friend of the gift and the magazine will be mailed as you direct. Use the coupon below:

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DETROIT SCHOOL OF LETTERING
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JUST OUT! LIGHTS GAS INSTANTLY WITHOUT STARNO, OR FLAME! SELLS LIKE WILDFIRE WHEREVER GAS IS USED — RETAILS FOR 25¢
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Electricity seeks men of action! Jobs up to $10,000 a year are open to men who have received special training such as is given in the School of Engineering of Milwaukee—one of the foremost and best equipped Electrical schools in America. If you have 14 high school credits or equivalent, you can become an electrical engineer with Bachelor of Science degree. Lacking credits can be made up in our short special course.

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Learn by the thorough, approved scientific methods which our 26 years of specialising enable us to give you. In addition to Electrical Engineering, the following complete courses are given: **A. C. and D. C. Armature Winding—Wiring and Testing—Commercial Electrical Engineering—Automotive Electricity—Radio Sales Service and Broadcasting—Electrical Refrigeration.**

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2. What is the purpose of the "Flight Tutor" device? See page 92.

Letters from the Shop Mail Box

(Continued from Page 190)

power plant. I have progressed with it very nicely until the question of what kind of wheels to use came up. I had thought of using motorcycle sidecar wheels, but find that the hub will not fit a Ford spindle. Would you be so kind as to give me what information you can in regard to any other kind of wheel I may use? I have made the car of old Ford parts, and the total cost so far amounts to about $25, so I want an inexpensive wheel.

Sincerely,
S. M. HANNA.

314 Ford Building,
Detroit, Mich.

In answering Mr. Hanna, we have suggested that he use the 18x3 inch tires and wheels such as are used in light 500-lb. airplanes. It is interesting to note that Mr. Hanna is not entirely alone when it comes to the baby car idea, one inventor having perfected a three-passenger car which he is ready to put on the market to retail at $200. Photos of this interesting car appear on page 163.

* * *

SNATCHING up a bit of waste to remove the printer's ink from his hands, the editor says "howdy" to a fellow mechanic who is unnecessarily apologetic in requesting the floor for a moment. The suggestions which he makes in his letter are all good ones, and it so happens that Editor Ray Kuns of the Motor Mechanics department has been preparing an article on building small racing cars which will be seeing the light of print in a short while now.

Dear Editor:

Any room in the shop mail box for a greasy motor mechanic? If so, I'll have my say and clear out before I muss things up. I think your mag is first rate and never miss an issue. I like your articles on aviation and model building, but something I've been looking for in the Motor Mechanics department has failed to show up. That is, some ways or means of taking a light car and making it fast and dependable on the road.

That's my pet hobby—trying to see how much speed I can get out of a motor. I can't claim any brilliant success, though, and I've been hoping that Mr. R. F. Kuns would give us a little dope on that. Here's the sum and substance of what I'd be glad to see some time early this fall and winter. How to take a Ford motor, model T, and without any great expenditure soup her up

(Continued on Page 196)

An UNFORGETABLE Story of the Late War

KILLERS OF COMPANY G

Lieutenant Warren puts a quick end to the mad assassins of his company.

BY

Arthur Guy EMPEY

in January

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After completing the course he wrote us: "Yours is the finest course ever presented for the Tenor Banjo. Before I enrolled with you, I knew nothing whatever about music. I was earning $18.00 weekly clerking in a store. Little did I realize the opportunity that had come. I took up the course just for fun. But here I am playing in one of the best Orchestras in western Michigan and making $85.00 a week. Your course and your kind cooperation have made me a professional Tenor Banjoist."—Kenneth McCarty, Tuckview Hotel, South Haven, Mich.

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Whether a salary of $65 to $100 a week—or spare time playing at $5, $10, $15, or more a night—interests you or not—think of the fun in store for you. In one to three months we can train you at home to play this marvelous, melodious instrument with a fine easy skill that will make you the envy of all other eyes. Think, too, of the pleasure of being able to express yourself musically when alone! You're passing up the best times of your life if you pass up an opportunity like this to learn at slight cost and with no inconvenience at all the world's most popular instrument. DON'T DO IT! Decide NOW to learn more about The Play-Way—the quickest, surest short-cut ever devised to social and professional success.

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Send at once for "The Play-Way to Popularity and Big Pay." Learn all about our unique method of training you at home, about the big, professional size Tenor Banjo, Phonograph Records and complete Outfit that we send you along with your very first lesson. Undreamed of possibilities for pleasure, popularity and big pay are open to you the minute you "become good." The book below is your first step. Take it now. Clip the coupon while it's here before your eyes.

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Every selection of the course, fifty-five in all—comes to you on a phonograph record. You hear the instructor's playing just as though he were right at your side. The Play-Way is different. Interesting, FOOL PROOF! Get the good news the coupon brings. SEND FOR IT NOW!

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3. Why do you think you would make a good pilot? See page 92.

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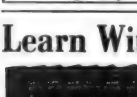

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Address .....
Employer's Name .....

Letters from the Shop Mail Box

(Continued from Page 194)

so that she can get out on the highway and hold her own with any fellow around fifty or sixty per. It can be done, I know, but I'd like definite information to work on. Also when you have got that motor dolled up, how about some plans for sport and speed bodies for the old Lizzie? I sincerely hope you can find room in your mag for some dope like that, and any suggestions I see along that line I'll carry out and tell you the results.

Now to get away from the car line. You've published articles on tricks with cards, stage tricks and "strong arm" tricks. How about getting us a line on how these "crap artists" educate the "bones"? One I met recently educated them at my expense. I bear him no ill will, but I've got a large amount of curiosity and I'd like to have an idea how he did it.

Wishing your magazine the best of success, I remain

S. E. POMERENKE.

* * *

THE nice thing about this colyumn is that it starts nowhere and goes no place—a sort of a ramble in aphasia. It isn't planned. It just writes itself. That's why sometimes we seem to run too much to electricity, too much to airplanes, too much to the features the book carries. But here's an opportunity to say something about next month.

Y'know, no magazine can be any better than its contributors can make it. Hence it pays to get good contributors. Next month will carry feature articles by Wm. Turner. Technical Editor of the Encyclopedia Britannica; Jay Earle Miller, prominent Chicago feature writer who has joined the editorial staff of MODERN MECHANICS: Harry H. Dunn, and others. Kenneth Brenaldo Murray has done a fascinating how-to-build on a home made rocket airplane—a model, of course—which will really fly with a penny rocket tucked away in its innards.

And Hans Reinsch, from Germany, contributes a story on German light plane progress.

Herr Dornier, famous German aeronautical engineer and designer of the Dornier Do-x, tells how he builds his giant planes.

All in all, gang, it's going to be a great book and we advise you to get your copy reserved early. Some members of the Hangar Gang have written in a month or

(Continued on Page 198)

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America's noted Cartoonists tell how you can learn at home in your spare time. Now you can learn how the cartoonists actually draw comical pictures. No long drawn out correspondence course. A remarkable book written by one of America's noted artists, called "Commercial Art and Cartooning." This One Big Book Explains Everything. Contains 125 illustrations—14 chapters.

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All old Envelopes with U. S. and Confederate Postage Stamps on them used before year 1880. I pay $1.00 to $25.00 each for old envelopes with pictures of flags, soldiers, etc., on them, used during the war between the North and South from 1861 to 1866. Used or unused stamps before 1880. Send all you have for my inspection or write for surprising information FREE. Address R. V. Rice, 2652 Asbury Ave., Evanston, Ill.

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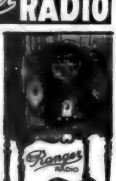

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(Attach letter stating age, occupation, employer and references' names and addresses.)

Letters from the Shop Mail Box

(Continued from Page 196)

two after the publication of an issue only to find that it was out of print and unavailable.

And say! In March, after we've had the "datter" on the conversion of the well known Lawrence 2-cylinder 4-cycle opposed aviation engine showing how to make a two-throw crank shaft for it, we have a ten-page article on the building of "Sunray" by the inimitable Sam Rabl. Sam is the naval architect who designed the Heath floats as shown in the 1930 FLYING MANUAL. Hailing as he does f'm daown b'Baltimore on the Chesapeake, all of Rabl's designs carry the stamp of authenticity. His little sailing sloop "Sunray," which will be published complete next month, is the first of a series of dandy boatbuilding articles done by men for whose work boat-magazine editors of the country are lying anxiously in wait. But wait till you see "Sunray"—wait 'till Sam himself tells you about her.

Orville Hickman is working on plans and a conversion for making a good lightplane motor out of the power head of an ordinary large sized outboard motor.

One of these days he'll have it ready. The idea is to get a reliable job—one that won't lay down because of mixture troubles and which will be air cooled. All on the make. Gang!

SOME time ago, we ran an article on the building of a radio controlled model battleship. It caused a lot of interest and not a little controversy. Some said it wouldn't work. We published photos showing the boat in operation. Some said the idea would interfere with government regulations regarding broadcasting. This was a bit beyond us, and we made no attempt to control the activities of Young America between 8 and 80 who seemed to be interested in the idea. other than passing along the warning of our radio editor to the effect that the amateur should acquaint himself with the licensing requirements of his district, which can be obtained from the Secretary of State of his individual state government.

A little while after the article was published a few wrote asking for more detailed data on a coherer, saying the silver filing coherer wasn't giving desired results. Ted

(Continued on Page 204)

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PREPARE NOW FOR GREATER THINGS!

Your own careful study of the development of aviation will convince you that the time is ripe for you to get started in this wonderful, fascinating industry. You no doubt realize that great opportunities are open to properly, thoroughly trained experts. Be ready for the great expansion in 1930.

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4. Can a dirigible tow a glider? See page 92.

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There are many objects in the picture of the circus above. See if you can find 5 that start with the letter "C." When you do that, write them on a piece of paper together with your name and address and send it to me right away.

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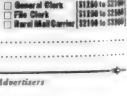

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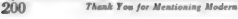

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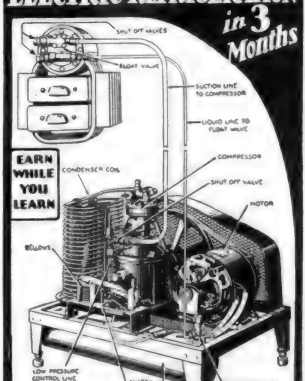

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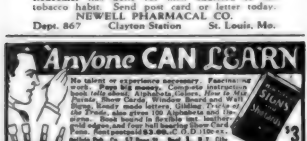

5. Has the R101 a larger gas capacity than the Graf Zeppelin? See page 92.

Letters from the Shop Mail Box

(Continued from Page 198)

Allen, our Amateur Electrician editor, suggests that a very reliable coherer can be made by using a vertical tube, such as made from a little perfume bottle, and plugging the ends with corks. An ordinary needle is placed in the bottom cork so that it will project into about a half an inch of silver filings which are placed there, and a magnetized needle projects through the top cork so that the tip just barely picks up some of the iron filings which are placed on top of the silver filings. Such a coherer is sensitive enough to operate any relay. The prime trouble with the coherer which Mr. Murray prescribed in his story was that the silver filings might have been substituted with tin foil or might have been filed from an ordinary spoon, which would inevitably have included a generous amount of brass. Any jeweler will obtain silver filings for you.

One last word before parting until next month: We're always glad to hear from readers in this department. If you've anything to say to us, write us a letter!

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OR BUICK SEDAN and $1,500 Extra Cash in Our Great New Advertising Campaign

Santa Claus is a jolly fellow who makes millions happy. But good old St. Nick was never as generous as we are in this great new advertising campaign. In the past we gave thousands of dollars in awards. F. Sieglinger won $3,000, Edna Ziler won $1,975, Tillie Bohle won $1,500 and many others. Now better than ever. Enter now and win.

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25 Grand Prizes
$3,000 Given

$1,500 Extra Cash is For Promptness

If you are prompt and win First Prize I will give you $1,500 as extra prize just for promptness.

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Nothing to buy now or later. Doesn't cost a penny to win. You may be the next one.

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Promptness pays extra cash. You can share in this great advertising cash distribution. All who take an active part are sure to be rewarded. Some one wins $3,500 First Prize Money—Why Not You? Duplicate prizes in case of final ties. If you want to win write at once for information. You have nothing to lose.

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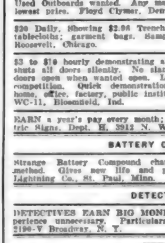

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6. Who is Jimmy Doolittle? See page 92.

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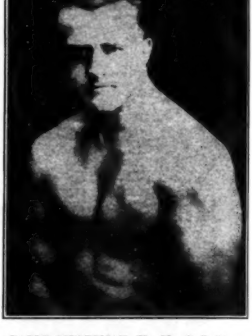
Address.....

If You Were Dying To-night

and I offered you something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.



EARLE LIEDERMAN, The Muscle Builder
Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," "Endurance," Etc.

A Re-Built Man

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

All I Ask Is Ninety Days

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile, I'm putting life and pep into your old backbone. And from then on just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real work. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A Real Man

When I'm through with you, you're a real man. The kind that can prove it. You will be able to do things that you had thought impossible. And the beauty of it is you keep on going. Your deep full chest breathes in rich pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge, square shoulders, and your massive muscular arms have that craving for the exercise of a regular he man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life to you.

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EARLE LIEDERMAN
DEPT. 3501 — 305 BROADWAY, N. Y. CITY

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Chrysler	30¾	Hupmobile	24½	Packard	21½	Star	41¾
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